Class of 2020
Research Poster Day

May 28, 2019
12:00 PM – 5:00 PM
Class of 2020
Research Poster Day

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Class of 2020
Research Poster Day

Schedule

Noon-1:30 PM  Poster Exhibits: Bruce Frankel Room, 3rd Floor
1:30-2:00 PM  Lecture by Dr. D. Scot Malay: Room 203
2:00-4:00 PM  Poster Presentations and Awards: Room 203

4:00-5:00 PM  Poster Exhibits: Bruce Frankel
Reception: Cafeteria
May 28, 2019

Dear NYCPM Community:

Every single poster pictured here attests to an extraordinary effort of research and investigation by students simultaneously deeply engaged in their other course work. The scholarship evident is a testament to both students and their faculty mentors. I applaud you all.

Delving deeply into a relevant aspect of a subject can be so enlightening that it seems to add a new dimension to the work at hand. The foot and lower extremity offer myriad opportunities for the revelations that innovative research provides. The posters in this journal and on the walls of the school on May 28 attest to those possibilities.

Will some of our students devote themselves as doctors of podiatric medicine to research? I trust they will. As we stand on the cusp of a new age in the profession – in which computers will play an increasing role – I hope that a number of our students will engage in research that helps usher podiatric medicine into this increasingly digital age, while never forgetting their ultimate focus on helping patients walk, run, and live with pain-free feet. Perhaps the thrill of research, of novel discoveries, will enhance the daily exhilaration of improving and saving lives.

My best wishes to you all.

[Signature]

Louis L. Levine

The New York College of Podiatric Medicine is affiliated with the Foot Center of New York
Dear NYCPM Community

Research and publications are the means to advancement in all aspects of health care. It is the very basis of progress and the development of modalities used to improve wellness for everyone.

The requisite skills required to investigate and then disseminate in a clear, reliable and valid format new ideas, theories and knowledge bases are not necessarily easy ones to learn and master. The yearlong exercise which has culminated in today’s Poster Research Day, where groups of students working under the mentorship of faculty, is a valuable and productive one.

I thank all the faculty and support staff who contributed to the process. The results are self-evident for all to see.

May this be just the beginning of a long journey into this discipline for our students.

Sincerely,

Michael J. Trepal, DPM
VP for Academic Affairs and Dean

The New York College of Podiatric Medicine is affiliated with the Foot Center of New York.
Class of 2020
Research Poster Day

Steering Committee

Eileen Chusid, PhD, Chairman
Kenneth H. Astrin, PhD
Robert Eckles, DPM
Alain Silverio, EdM
Meave Corcoran, BSc (Hons) MSc MChSI
May 15, 2019

Dear NYCPM Community,

This is our second annual Poster Day. We are very proud and pleased to allow NYCPM third year students to present the results of their research. The student doctors have worked diligently to choose topics of interest to the podiatric community at large. They have worked with the guidance of faculty mentors but most of the work had been done independently. They have adhered to the principles of good clinical practice and followed all FDA research guidelines. They have prepared IRB submissions, obtained CITI certificates for the protection of human research volunteers, performed literature searches, conducted the research and where applicable sought assistance in statistical analysis of their work. Our hope is that they will continue to advance research and knowledge in Podiatric Medicine. So thank you students for your hard work and congratulations on a job well done!

Dr. D. Scot Malay, editor of The Journal of Foot and Ankle Surgery, has again this year accepted our invitation to deliver the keynote address and to judge the posters. We offer our sincere thanks to Dr. Malay as well as to our Academic Dean, Dr. Michael Trepal for arranging Dr. Malay’s visit. We would like to thank the clinical faculty at NYCPM for devoting their time, talent and knowledge in mentoring the student research groups.

It is our hope that this experience has been rewarding and again many thanks to all for preparing the excellent posters on display today.

Sincerely,

Eileen D. Chusid

Eileen D. Chusid, Ph.D.
Dean of Pre-Clinical Sciences
Chair, Steering Committee
Class of 2020
Research Poster Day

Guest Speaker and Judge

D. Scot Malay, DPM, MSCE, FACFAS

Director of Podiatric Research
Penn Presbyterian Medical Center
Philadelphia, PA

Editor: Journal of Foot & Ankle Surgery

D. Scot Malay, DPM, MSCE, FACFAS
Dr. Malay is director of Podiatric Research at the Penn Presbyterian Medical Center. He received his Bachelor of Science in Biology from Juniata College, and then attended the Pennsylvania College of Podiatric Medicine (PCPM, now the Temple University School of Podiatric Medicine) in Philadelphia, graduating with honors in 1983. He then completed a 3-year residency in foot and ankle reconstructive and trauma surgery at the Northlake Regional Medical Center (formerly Doctors Hospital) in Tucker, Georgia. In 1986, Dr. Malay returned to PCPM as an Assistant Professor of Surgery and Co-Director of Continuing Medical Education. While teaching foot and ankle surgery to podiatric medical students and residents, Dr. Malay maintained clinic and private practices and served as chief investigator on biomechanical and surgical research projects. In 1992, Dr. Malay moved to State College, Pennsylvania, and established Nittany Valley Podiatry. In 2001 he sold his private practice and returned to Philadelphia and joined the Ankle & Foot Medical Centers. He is Board Certified by the American Board of Podiatric Surgery and by the American Board of Podiatric Orthopedics and Primary Podiatric Medicine. He is also a member of the American Podiatric Medical Association, the Pennsylvania Podiatric Medical Association, and the Foundation for Foot Surgery, and he is a national and international lecturer in foot and ankle surgery and a member of the teaching faculty of the Podiatry Institute. In 2005, he received his Masters of Science in Clinical Epidemiology and Biostatistics from the School of Medicine of the University of Pennsylvania, in Philadelphia, PA. Dr. Malay is also the Editor of the Journal of Foot & Ankle Surgery, which is the society publication of the American College of Foot and Ankle Surgeons. His works are published in textbooks and journals of foot and ankle surgery, and his particular interests include reconstructive and traumatological foot and ankle surgery, diabetic foot infections and wound care, and management of the insensitive (neuropathic) and dysvascular (poor circulation) foot.
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POSTERS
AND
ABSTRACTS
A SURVEY OF DIGITAL IMPLANTS EFFICACY AND COMPLICATION RATES

Jonathan Engelhardt, Benjamin Kaplan, Natalie Moursalian, Mario Porciello Ed.M., Ria Sajnani, Kevin Jules D.P.M.

Abstract

Introduction: hammertoe deformity is a common chief complaint seen by all podiatric surgeons. Hammertoe is defined as a plantar flexion at the metatarsophalangeal joint and a dorsiflexion at the proximal interphalangeal joint. Although conservative treatment commonly alleviates pain, many patients undergo hammertoe correction surgery when conservative treatments become exhausted. Methods: In the literature review conducted, digital implants were compared and evaluated for union and complication rate. Studies that utilized the data analysis included case series or higher level of evidence that were written in American English, those that had at least two post-operative visits, articles after the year 2000, articles from PubMed, or those that were deemed compliant based upon each individual case series. Hammertoe implants were only considered in right foot through five while those in the first ray were excluded. The studies that were excluded were those with fewer than 4 toes or other non-implanted material. Results: after applying exclusion criteria, 962 toes incorporating 8 different implant brands were compared. The highest union rate was seen in the cannulated screw with 94.16% of the implants being successful (union). However, individually one Smart Toe study had a union rate of 96.54%. The lowest average complication rate was seen in the Ipp-on™ implant study at 1.2%. Discussion and Conclusions: Based on our review, the study recommends using cannulated screws over SmartToe™ for optimal results. Further information on surgeon experience and comorbidities are needed for a more comprehensive review.

Methods

Our inclusion criteria were studies found on PubMed, studies written in American English, at least two post-operative visits, and articles published after the year 2000. The following PubMed keywords were used: implants, hammertoe, arthrodesis, fusion, lesser digits. Our inclusion criteria included non-English studies, use of k wires, 1st MTP arthrodesis, non-fusions. We collected data from ten studies on eight different lesser digit implant models. Data collected was based on number of patients in the final analysis, number of toes in final analysis, number of unions, and complication rates. We calculated the overall union rate, smart toe union rate, and smart toe complication average (Table 1).

Conclusions

Overall, the highest union rate was seen in the cannulated screw with 94.16% of the implants being successful (union). Cannulated Screws displayed a success rate of 96.4%. The average success rate was the same with a complication average of 1.2%. This indicates that surgeons must be cautious in determining SmartToe™ as an appropriate implant.

References

[Provide references here if necessary]
# A Survey of Digital Implants Efficacy and Complication Rate

Jonathan Engelhardt, Benjamin Kaplan, Natalie Moursalian, Mario Porciello, Ria Sajnani.

Mentor: Kevin Jules DPM

Abstract

Hammertoe deformity is a common chief complaint seen by all podiatric surgeons. Hammertoe is defined as a passive dorsiflexion at the metatarsophalangeal joint and a plantarflexion at the proximal interphalangeal joint. Although conservative treatment commonly alleviates pain, many patients undergo hammertoe correction surgery when conservative treatments become exhausted.

In the literature review conducted, digital implants were compared and evaluated for union and complication rate. Studies that were utilized in the data analysis included case series’ or higher level of evidence that were written in American English, those that had at least two post-operative visits, articles after the year 2000, articles from PubMed, or those that were deemed compliant based upon each individual case series. Hammertoe implants were only considered in digits two through five while those in the first ray were excluded. The studies that were excluded were those with fixation from K-wires or other non-implanted material.

After applying exclusion criteria, 842 toes incorporating 8 different implant brands were compared. The highest union rate was seen in the cannulated screw with 94.12% of the implants being successful (fusion). However, individually one Smart Toe study had a union rate of 96.4%. The lowest average complication rate was seen in the Ipp-on™ implant study at 3.2%.

References


INDICATIVE RISK FACTORS OF ANKLE EQUINUS IN DIABETICS

Emily Lewson, Ronald Lowe, Elizabeth Franger, Frederick Kaestel, Samuel Adegbuyega DPM,

INTRODUCTION

In regards to the treatment of diabetes, the American Diabetes Association has recommended screening for asymptomatic individuals, with a targeted hemoglobin A1c (HbA1c) of 6.5%. Increasing evidence has been reported that suggests HbA1c is a critical indicator of chronic complications and associated secondary outcomes. Uncontrolled diabetes leads to increased risk of microvascular complications, which may be prevented through early intervention. Therefore, a more comprehensive understanding of the risk factors associated with diabetes complications is required. This study focuses on the role of ankle equinus in diabetics as a potential marker of diabetic complications.

METHODS

Participants: This study involved 100 individuals who were diagnosed with diabetes mellitus type 2, with and without ankle equinus. The patients were recruited from the Endocrinology Department of the University Hospital, and the data collection was conducted over a period of six weeks. Participants were classified based on their clinical status and the severity of their ankle equinus.

RESULTS

The data collected in Table 2 indicates a significant correlation between the duration of diabetes and ankle equinus. A lower regression coefficient of 0.055 was observed for a duration of diabetes equal to 10 years.

DISCUSSION

It has been demonstrated that the lack of correlation between the duration of diabetes and the degree of ankle equinus is not observed when a Student's t-test is used. The correlation coefficient of 0.055 suggests a strong correlation between the duration of diabetes and ankle equinus.

REFERENCES

# 2

## Indicative Risk Factors of Ankle Equinus in Diabetics

Emily Lewson, Ronald Lowe, Elizabeth Franger, Frederick Kaestel.

**Mentor: Samuel Adegboyega, DPM**

## Abstract

With documented increased rates of equinus in diabetic populations, this study investigates if a single variable factor may be a positive predictor for decreased ankle dorsiflexion. The duration of diabetes, HgA1c, BMI, and smoking history were evaluated in relation to the range of motion of the ankle. While a larger study would be necessary to positively confirm our found results, the data set collected suggested that increased duration of diabetes may be most associated. In this way, duration of disease should be considered by podiatrists as an indicator to prophylactically offload increased plantar pressures caused by decreased ankle dorsiflexion, thereby decreasing risks of ulceration.

## References


DIAMOND-SHAPED DORSAL PLATES IN FIRST METATARSOPHALANGEAL FUSION: A NOVEL CONSTRUCT FOR ARTHRODESIS

Dr. Samuel Adegboyega DPM, Stewart E, Mohamed Anwar, John Seha, Mohammed Islam

INTRODUCTION

First metatarsophalangeal joint (MTP) fusion has been the mainstay treatment for late stage arthritis at the 1st MTP joint, ranging from foot deformities of the first MTP to severe planar deformities from osteoarthritic changes characterized by pain, deformities and restricted motion of the great toe. Successful arthrodesis is dependent on creating an accurate, stable construct for a bone union to be maintained. Multiple methods have been described and utilized in the literature that do this, including Kirschner wires, staples, screws, bone grafting, plate fixation, and more. Some methods have fallen into disuse, while others, like the use of dorsal plate fixation, remain popular.[1,2]

METHOD, RESULTS, AND LITERATURE

Review of Literature

First MTP fusion is a highly successful procedure with an overall fusion rate ranging from 90-100% in recent literature.[1,2,3] Retrospective studies assessing patient satisfaction over a five-year period showed good to excellent results in nearly all patients.[4] meta-analysis of crew and bone arthrodesis therapy for rheumatoid arthritis and good to excellent in 51% of patients undergoing revisional arthrodesis surgery.[5] Previous studies have also demonstrated arthrodesis to be a reliable treatment for hallux valgus.[6]

Past bone model biomechanical studies by Politi et al. have proven the most stable construct to be conical joint preparation and interfragmentary screw fixation.[7] However, the path of less resistance that was only used to include staple-assisted fusion techniques were reviewed.[8] The number of studies on staple-assisted fusion is low, and most studies are limited to case reports and small case series. A recent study by Politi et al. compared the use of staples with conical joint preparation and interfragmentary screw fixation.[9] The results showed no significant difference in fusion rates between the two techniques. However, the study was limited by the small sample size and the lack of long-term follow-up.

Surgical Approach

A dorsal plate is a semiconductor-based plate with a single cross-screw with built-in nonunion rate ranging from 0-100% and described in literature as a highly successful procedure.[10] In our study, we have developed a new technique for first MTP fusion using a diamond-shaped dorsal plate construct and interfragmentary compression screw.

Discussions

Our results show consistency with other current methodologies of MTP fusion, with no patients showing evidence of nonunion. A patient with incomplete radiographic information and were excluded from statistical analysis. In our series all patients are well-adapted into the achieved clinical fusion with no evidence of nonunion.

Inclusion criteria was intended for patients with a wide range of conditions. In order to demonstrate the versatility of the system as an alternative fashion, the following criteria were applied to have more outcomes available for the study. These criteria included assessment of pain, function, and postoperative smoking which could drastically affect the quality of the first MTP arthrodesis, and in turn the nonunion was profound.

1. Any ANKA statistics found significant reduction of iliac and M indicating successful statistical correction of IM and IL, and radiographic fusion confirmed for all 4 of the patients that met the inclusion criteria.

2. A lumbar vertebrae was a reported risk factor that prevented the use of imaging, and which caused the duration of the study to be shortened.

3. Therefore, plates should be on the compression side of the fusion, but our results suggest we achieved compression and union of all cases.

Qualitative benefits of the plate that are difficult to collect data for include an ability to visualise the joint space in Model oblique and Dorsal Raster radiographs of the test for any evidence of joint eversion, slippage, or early indications of nonunion.

This study was limited by the low number of cases available, which reduces the strength of the results found. Also, no clinical benefit was compared to first MTP fusions with using a standard plate to compare efficacy. The comparison between reduction of OR time between the 2 plates, the plate construct and 4.5 hole plate cannot be made, as limited data on plate constructs under adequate controlled conditions was available to support any statement on superiority. Further work would require a prospective, randomized controlled study assessing comparisons of the dorsal plate construct with a standard plate construct. The use of postoperative pain questionnaires would aid in further data collection and allow for the use of the ASRM survey for further research and would help standardize the procedure for comparison across other methods of first metatarsophalangeal fusion.
# 3
Diamond-shaped Dorsal Plates in First MPJ Fusion: A Novel Construct for Arthrodesis

Stewart Kite, Mohamad Anwar, John Seha, Mohammad Islam.

Mentor: Samuel Adegboyega, DPM

Abstract

Arthrodesis of the first metatarsophalangeal (MTP) joint is the mainstay treatment for a variety of arthritides and deformities. Studies by Politi et al (1) and Hyer (2) reported superiority of a dorsal plate with a single compression screw as the strongest method of fusion with low nonunion rates, but a gap exists in the literature in regard to optimal plate design. Using a unique diamond-shaped plate allows early weight bearing, less surgical time, and other benefits all with a more minimal incision. No studies appear to exist on the use of a diamond-shaped dorsal plate with a compression screw in the literature, so we present our series of patients.

Materials and Methods

8 cases of 1st MTP joint fusions were performed using a Stryker uni-cp compression plate or Wright Medical Claw II polyaxial compression plate over the course of Aug 2015 to Dec 2018 at Lincoln Hospital. Results were assessed via surgical outcome characteristics taken retroactively as described by Hyer et Al. Descriptive statistics for the patient population was calculated, and 1-way ANOVA advanced statistical analysis was used for postoperative and preoperative radiographic angle comparison.

Results

100% of patients that met inclusions criteria showed no evidence of a malunion or nonunion, nor evidence of surgical site infection. No patients required revision surgery. Statistical analysis using 1-way ANOVA with a p-value of .05 showed statistical correction of IM and HA with the dorsal diamond compression plate with compression screw.

Conclusion:

Utilizing a diamond-shaped dorsal plate and compression screw showed no incidence of fusion in malunion in our case series, consistent with results with similar results design in literature. The diamond plate provides the high success rate inherent to the construct with the added benefit of a lower profile, quicker operating time, and the presence of a surgical window to more readily identify a potential nonunion radiographically. A call for more published data in a controlled environment is needed before the diamond plate construct can be called superior.

References


Efficacy of Procalcitonin as a Diagnostic Marker for Diabetic Foot Infections
Stephanie Solanki BS, Jobin Mathew BS, Sanjeev Baldeo BS, Faiza Javaid BS, Abir Ahmed BS, Sharon Barlizo DPM

Abstract

Introduction
Procalcitonin (PCT) is a biomarker of systemic inflammation and can be measured in the blood. It is a sensitive and specific marker for bacterial infections, and its measurement can help differentiate between bacterial and non-bacterial causes of fever. In diabetic foot infections, PCT levels are higher compared to other types of infection. However, the use of PCT in diabetic foot infections is still controversial. This review will summarize the current evidence on the use of PCT in diabetic foot infections.

Methods
A systematic review of the literature was conducted using PubMed, Medline, and Google Scholar databases. The search terms used were “procalcitonin” and “diabetic foot infections.” The search yielded 52 articles. Articles that focused on surgical outcomes, antibiotic therapy, and other markers of inflammation were included. All papers included in the study were written in English and published within the last 5 years.

Results
Fifty-two articles were reviewed, and 19 studies were included in the final analysis. PCT levels were found to be higher in diabetic foot infections compared to non-diabetic foot infections. PCT levels were also found to be higher in patients with severe diabetic foot ulcers compared to those with mild ulcers.

Conclusion
Procalcitonin is a promising biomarker for the diagnosis of diabetic foot infections. Further studies are needed to clarify the role of PCT in the management of diabetic foot infections.

Introduction & Methods

Diabetic Foot Infections
Diabetic foot infections are a significant public health concern, affecting millions of people worldwide. They are caused by a combination of factors, including ischemia, neuropathy, and infection. The prevalence of diabetic foot infections is estimated to be between 15% and 35% of all diabetic patients. The infection rate is higher in type 1 diabetes than in type 2 diabetes.

Procalcitonin
Procalcitonin is a protein that is produced in the liver in response to bacterial infection. It is a sensitive and specific marker for bacterial infections. PCT levels are elevated in the blood of patients with bacterial infections, including diabetic foot infections.

Study Population
The study population consisted of patients with diabetic foot infections. Patients were selected based on the presence of a diabetic foot ulcer and a positive cultures from the ulcer.

Study Type
The study type was a prospective study.

Key Findings
PCT levels were found to be higher in patients with severe diabetic foot ulcers compared to those with mild ulcers. PCT levels were also found to be higher in patients with diabetic foot infections compared to non-diabetic foot infections.

Comments and Study Limitation
Further studies are needed to clarify the role of PCT in the management of diabetic foot infections.

Discussion and Conclusion

Procalcitonin is a promising biomarker for the diagnosis of diabetic foot infections. Further studies are needed to clarify the role of PCT in the management of diabetic foot infections.

References

- Fooshee et al. (2019) Meta-analysis and systematic review
- Simon et al. (2018) Meta-analysis
- Uzun et al. (2017) Procalcitonin levels in infected diabetic foot ulcers
- Sumer et al. (2016) Procalcitonin levels in diabetic foot infections
- Park et al. (2015) Procalcitonin levels in diabetic foot infections
- Jeandiot et al. (2014) Procalcitonin levels in diabetic foot infections
- Sheh et al. (2013) Procalcitonin levels in diabetic foot infections
- Van-Asten et al. (2012) Procalcitonin levels in diabetic foot infections

Systematic reviews were included in the study. All papers included in the study were written in English and published within the last 5 years.
Efficacy of Procalcitonin as a Diagnostic Marker for Diabetic Foot Infections

Stephanie Solanki, Jobin Mathew, Sanjeev Baldeo, Faiza Javaid, Abir Ahmed.

Mentor: Sharon Barlizo, DPM

Abstract

Approximately 20% of all hospital admissions in people with diabetes are due to foot ulcers\(^1\). Infected foot ulcers take a much longer time to heal compared to non-infected ulcers\(^3\). Infection of these ulcers is much more likely to lead to gangrene and ultimately amputation, with about 50% of severe diabetic foot infections leading to amputations\(^4\). This emphasizes the necessity of diagnosing and differentiating infected and non-infected diabetic foot ulcers\(^2\). Markers that have been used previously for the diagnosis of infected diabetic foot ulcers include white blood cell count (WBC), C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR), however it has been shown in some studies that procalcitonin is superior to these markers in differentiating infected and non-infected diabetic foot ulcers\(^4\). Procalcitonin is a precursor of calcitonin, which is a hormone that is secreted from C-cells located in the thyroid gland. In instances of severe bacterial infection procalcitonin levels increase at a rapid pace, however in viral infection as well as non-specific viral infections it remains low in comparison\(^4\). Due to this trait, there has been increased interest in the role of procalcitonin to distinguish between infected and non-infected diabetic foot ulcers.

References

The Validity of the Medical College Admission Test in Predicting Academic Performance in Pediatric Medical School

Emma Otieno, BA, BS; Amir Baharloo, MD; Ereny Mousa, MD; Zabdi Sanchez Prada BS; Thanh Thao T. Nguyen, BS; Marie-Christine Bergeron, DPM

ABSTRACT

Introduction: The Medical College Admission Test (MCAT) is currently a standardized examination used in the selection of medical school admissions. Its composite score is frequently interpreted as a predictor of academic success in medical education. For this study, the MCAT and the APAME boards examinations were used as predictors of academic success in pediatric medical school. The data were obtained from the American Medical College Application Form (AMCAF) and the American Board of Medical Specialties (ABMS). The objective of this study was to determine the correlation between MCAT scores and APAME boards examination scores in pediatric medical school.

Methods: This study assessed the correlation between composite MCAT scores over four academic success as determined by GPA and board examination pass rates at a single pediatric medical institution. The study sample consisted of 120 students from the years 1990 to 2010. All students had a complete set of scores for both the MCAT and APAME boards examinations. A total of 68 students were included in the final analysis after excluding those with incomplete data. The study was approved by the institutional review board.

Results: The logistic regression model analysis showed that students with a high MCAT score were more likely to pass the APAME boards examination. The model explained 15% of the variance in APAME pass rates.

DISCUSSION

Overall, the findings of the present study are limited in several ways. First, the dataset is composed of academic performance scores from a single medical institution. It is not clear how the results can be generalized to other medical schools. Second, the dataset does not include information on the number of students who applied to the institution. Therefore, it is not possible to determine the number of applicants who were not included in the dataset. Third, the dataset only includes information on academic performance. It does not include information on factors such as gender, ethnicity, or socioeconomic status. Therefore, it is not possible to determine if these variables affect academic performance.

In conclusion, we found that MCAT scores have a weak correlation with academic performance in pediatric medical school. Future studies should be conducted to further investigate the relationship between these variables.
The Validity of the Medical College Admission Test (MCAT) in Predicting Academic Performance in Podiatric Medical School

Emma Otieno, Amir Baharloo, Ereny Mousa, Zab’di Sanchez Prada, Thanh Thao T Nguyen.

Mentors: Marie-Christine Bergeron, DPM & Fortunato Battaglia, DPM

Abstract

Thesis: The predictive validity of the Medical College Admission Test (MCAT) scores is positively associated with cumulative grade point average (GPA) in podiatric medical school.

Objective: To investigate whether the MCAT is predictive of academic success as conveyed by cumulative GPA in podiatric medical school.

Methods: This blinded study assessed the validity of the MCAT in predicting overall academic success at a single podiatric medical institution. The study population consisted of 117 medical students at the New York College of Podiatric Medicine (NYCPM) who matriculated in 2014 and graduated in 2018.

Conclusion: The MCAT is a good indicator of academic success at a single podiatric medical institution.

References

1. The MCAT: A History and Current Overview • Student Doctor Network [Internet]. Student Doctor Network. 2016 [cited 2019 May 20]. Available from: https://www.studentdoctor.net/2016/05/03/the-new-mcat/
Low Level Laser Therapy As A Modality In The Management of Plantar Fasciitis

Sharaara Rahman, Anuj Paul, Nicholas DiScafa, Nadia Hameed, Amnoo Tank, Tariq Rasheed, Mujtaba Qureshi, Dr. Robert Eckles, Dr. Reem Sheik

Abstract

Plantar fascitis is one of, if not the most common causes of pain affecting the foot. It is a chronic inflammatory and degenerative process of the connective tissue. Plantar fascitis has been shown to affect middle aged and older people and women more than men (1). It is responsible for approximately 1 million physician visits each year, (2) resulting in nearly 300 million dollars per year being spent or treatment is the United States (3). Currently available treatments are often ineffective, and have not been shown to eradicate a substantial amount of pain (4). A recent study showed that 90% of patients reported relief from pain with the use of MLS Laser Therapy (5).

Introduction

This IRB approved study seeks to investigate the effectiveness of low Level Laser Therapy (LLLT) using the Enchronia FX635 for the treatment of PF. The FX635 laser, an FDA approved device, will be utilized during the trial period. Currently, the effectiveness of other modalities such as NSAIDS, corticosteroid injections, extracorporeal shockwave therapy, ultrasound, and PRP have been experimented with, however, LLLT has not yet been experimented with. This study seeks to demonstrate that LLLT can reduce the plantar fascia thickness, which is associated, according to other published data using corticosteroid injection and extracorporeal shock wave therapy, with clinical progress. Subjects with a history of similar chronic plantar fasciitis will be excluded (6). The protocol was approved by the Institutional Review Board of the New York Hispanic Health Care Center (NYCHCC).

Methods

The primary goal of this IRB approved study is to demonstrate that Low Level Laser Therapy (LLLT) can be used as an effective treatment modality for plantar fasciitis, and to determine if the use of this modality also creates objective change in the thickness of the plantar fascia and subjectively for the patient, using the AOFAS Hindfoot Scoring Method. An additional goal of the work was to subject the available literature on LLLT efficacy and publications correlating decreased plantar fascia thickness with subjective clinical improvement to the Downs and Black Tool to determine that the study protocol would have validity. These results, which indicate that both areas of the reviewed literature scores highly, are presented below.

Following IRB approval in February of 2019, enrollment to the study began. To date, 3 patients have been enrolled and followed up to 3 weeks of treatment. The mean plantar fascia thickness for those subjects studied, prior to intervention, is uniformly greater than 4 mm, where the "normal" value is 2-4 mm. Figure 1 demonstrates an ultrasound image of normal plantar fascia. Figure 2 demonstrates an image of a thickened plantar fascia measuring 3 mm diameter.

Figure 1: Image of normal plantar fascia

Figure 2: Image of thickened plantar fascia

As the study protocol requires a minimum of 25 patients, the end goal of the work is not yet near; the studies and attending staff at the PCNY intend to continue enrollment through the 2019-2020 academic year to reach a more statistically powerful enrollment figure. We anticipate this data will prove useful, once analyzed, in answering the 3 stated study objectives.

Objective and Subjective Measures Taken:

1. Plantar Fascia Thickness

   - Plantar fascia thickness of greater than 4 mm in ultrasonic analysis is widely accepted as significant in patient diagnosis due to the inflammatory changes caused by microtears and injury to the ligament.

2. AOFAS Hindfoot Scoring Utilized:

   - Enrolled patients were found to have an average origin AOFAS Hindfoot Score of 67.25. No patient has reached the study endpoint at this time, so no trend can be observed for this portion of the study.

   - The AOFAS Hindfoot scoring system also allows inclusion of both objective and subjective analyses of the data.

3. Downs and Black Checklist:

   - This was implemented as a quality assessment method for each of the individual 30 articles. The average score in each section of all articles reviewed is as follows:
     - The total average of all reviewed articles out of 32 scored points on the Downs and Black checklist was 24.6/32 = 77.6% matched with all quality assessment categories.

Most studies that have been reviewed utilize either a single subjective (plantar fascia thickness) or objective (VAS analog scale) clinical progression marker to analyze their studies to prove the effectiveness of a certain treatment modality for plantar fasciitis. However, in our study, we look at both subjective (AOFAS hindfoot scoring) and objective factors (plantar fascia thickness) to obtain a higher quality statistics for the clinical trial.
Low Level Laser Therapy Effect on Plantar Fascia Thickness

Sharaara Rahman, Anuj Paul, Nicholas DiScala, Nadia Hameed, Anmol Tank, Tariq Rasheed, Mujtaba Querishi.

Mentors: Robert Eckles, DPM & Reem Sheikh, DPM

Abstract

Plantar fasciitis is one of, if not the most common causes of pain affecting the foot. It is a chronic inflammatory and degenerative process of the connective tissue. Plantar fasciitis has been shown to affect middle aged or older people and women more than men (1). It is responsible for approximately 1 million physician visits each year, (2) resulting in nearly 300 million dollars per year being spent on treatment in the United States (3). Current treatment modalities are constantly being evaluated to establish a more effective standard of care. A meta-analysis performed by Li et. al. compared 8 forms of conservative treatment; ranging from NSAIDS, cortico-steroid injections, extra-corporeal shockwave therapy, ultrasound and PRP and concluded that ESWT ranked first for all outcomes (3). It is important to note they did not consider Low Level Laser Therapy (LLLT) as a treatment modality in their study. Ulusoy et. al. compared ESWT, Therapeutic US and LLLT in the treatment of plantar fasciitis and concluded that LLLT and ESWT yielded similar outcomes and both were more successful than US (4). More importantly, additional research is being conducted on the efficacy of LLLT, a Systematic review and Meta-analysis from the Journal of Medicine published in 2019 by Wang et. al. indicated that LLLT in patients with plantar fasciitis significantly relieves heel pain (5).

The primary goal is to investigate the effectiveness of low-level laser therapy as a modality of treatment for plantar fasciitis. The assessment will be done by documenting the thickness of the plantar fascia via ultrasound once prior to the treatment, in order to establish a baseline measurement, and then once again at the conclusion of the 4-week trial. The effectiveness of the therapy will also be measured via the AOFAS Hindfoot scale, which will again be recorded once prior to the therapy and then a second time following completion of the trial. The FX635 laser, an FDA approved device, will be utilized during the trial period. Subjects with a history of acute or chronic plantar fasciitis will be selected from The Foot Clinic of New York in Harlem. 25 subjects between the ages of 18-65 with no prior history of trauma or surgery in respect to the plantar aspect of their feet will be selected for the study. Subjects partaking in the study will be receiving low-level laser treatment using a 635nm laser for twice a week for a four week duration.

References


Radiographic Analysis of Average Crista Size and Case Presentation of an Anatomical Variant
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1. Third Year Podiatric Medical Student, New York College of Podiatric Medicine - New York, NY
2. Clinical Instructor, Department of Medicine, New York College of Podiatric Medicine - New York, NY

Statement of Purpose
The sesamoid complex, which transmits up to 50% of an individau's body weight, is susceptible to numerous pathological conditions. These pathologies include, but are not limited to: sesamoiditis, stress fractures, turf toe injuries, and avascular necrosis. Many of these pathologies present with a primary complaint ranging from the 1st metatarsal submetatarsal region, and imaging is usually required to determine the type of injury sustained to the patient. It must be noted, however, that variations to the sesamoid complex of the 1st metatarsophalangeal joint de exist and may initially suggest a pathological finding. We present a case of a patient with a traumatic injury to the sesamoid complex and an anatomical variant of crista size. This finding led us to determine an average crista size of the Foot Center of New York patient population.

Literature Review
The sesamoid metatarsophalangeal joint complex of the first metatarsophalangeal joint (MTPJ) plays an integral role in the function of the foot. The sesamoids are two "seed-shaped" bones of the great toe, which function to absorb weight-bearing forces, decrease friction, protect the flexor hallucis brevis tendons, and dissipate forces on the metatarsal head[1]. Distal displacement of the sesamoids is rarely described in the literature and has been seen in cases involving dislocation of the MTPJ [2,3]. Injury to the flexor hallucis longus (FHL) [4,5] fractures of the sesamoids [6], and rupture of the interosseous ligament [7]. Several pathologies resulting in hallux sesamoid injury include: turf toe sprain, sesamoiditis, ligamentous injury and dislocation of sesamoids. Pain in the area of the sesamoid is generally blemished "turf toe" syndrome or trauma to the MTPJ-sesamoid complex [8]. Moreover, MTPJ dislocations, also known as turf toe injuries, are found injuries to the axial load applied to a foot in fixed equinus leading to disruption of the plantar joint complex [8,9]. Turf toe injuries are classified based on their reducibility, fracture of the sesamoids, and/or injury to the interosseous and sesamophalangeal ligaments [10,11]. In addition, the sesamophalangeal ligament plays an essential role in bridging the bial and fibular sesamoids, and injury to the ligament will destabilize the base of the proximal phalanx [12]. Imaging is usually needed to help diagnosis for a patient with an injury to the 1st MTP-video complex. DP and lateral X-rays can be sufficient to identify proximal migration of sesamoids after rupture of the sesamophalangeal ligament in patients with a turf toe injury. Additional views include 45 degree medial and lateral oblique X-rays and sesamoid axial views which can be used to better visualize the sesamoids. Acute fractures of the sesamoids involve irregular separation of the sesamoid with serrated edges and evidence of callus formation on repeat radiographs. MRI should be used to look for edema or evidence of fracture [14]. In terms of avascular necrosis of the sesamoids, radiographs may reveal fragmentation, however MRI is the most sensitive diagnostic test [15].

Case Presentation
A case is presented of a 10-year-old female who initially presented to the emergency department on February 27th 2017 with a nondisinfecting injury of her left foot. Patient presented with 9/10 pain and a cooked up position of the upper right toe. Radiographs of the right 1st metatarsophalangeal joint (MTPJ) revealed distal displacement and increased separation between the sesamoids (Figure 1). Initially, this was thought to be a Lisfranc Type 2A turf toe injury. The displacement of the sesamoids after a traumatic incident pointed towards rupture of the interosseous ligament, however, the anterior position of the sesamoids ruled out a turf toe injury. In a classic turf toe injury, the sesamoids are displaced posteriorly. MRI of the right foot was obtained for surgical planning and revealed an interosseous ligament tear (Figure 2). Right foot MRI revealed dislocation of 1st MTPJ and plantarflexion of the distal and proximal interphalangeal joints. The sesamoids were displaced distally and abnormally distanced from each other with a fracture of the left sesamoid. Evaluation of the plantar plate was limited due to the low resolution however the interosseous ligament was determined to be intact. Contralateral radiographic views of the left foot were taken for comparison to the right foot which revealed the same unusually wide size and position of crista. The patient was treated with healing of the right hallus in a plantarflexed position and a short heel cast to remain off weight-bearing. On April 3rd, the patient was given a CAM boot to ambulate. Radiographs were taken on her follow-up visit on May 4th, which revealed no new changes. The patient was then instructed to transition into shoes and gradually increase the dancer's pat. to the right pressure on the right 1st submetatarsal area.

Materials & Methods
Patient radiographs were obtained from AcuVue Cloud imaging database from the Foot Center of New York (FCNY). 11 sesamoid axial radiographs were compiled from the database from a total of 11 different patients (5 females and 6 males). Crista size was measured using the AcuVue Cloud "measure tool" in the frontal plane of the sesamoid axial radiographs. The points of measurement were from the center of the articulation of the tibial sesamoid to the center of the articulation of the fibular sesamoid of the 1st metatarsal. An example is shown in Figure 3. The average of measured crista distance was then calculated for an average crista size width. The sesamoid distance of the patient previously mentioned was taken using the imaging system of Quadramed. The patient had no sesamoid axial views, therefore sesamoid distance was measured using coronal MRI images and the measuring tool included in the Quadramed imaging software (Figure 4).

Discussion
Pathologies of the 1st MTPJ-sesamoid complex can vary in their clinical presentation and imaging. A detailed history and physical exam will guide a clinician to a concise list of differential diagnoses. Radiographs play an important role in determining the pathology and are the first-line imaging study following an injury to the 1st MTPJ-sesamoid complex. When analyzing an injury to the area, it is also important to assess anatomy and realize the variations in structures and morphology from patient to patient. The interosseous ligament attaches the tibial and fibular sesamoid bones, which are separated by the crista. A trauma to the area, such as in a turf toe injury, will cause rupture of the interosseous ligament and subsequent increase in space between the fibular and tibial sesamoids [10]. In our case, the trauma did not cause an increase in the distance between the sesamoids and instead, was an anatomical variant. Radiographic analysis or further imaging can guide diagnosis. However, variations in anatomy and morphology can disguise in a pathological finding. It is our case, an enlarged crista size was mistaken for an injury to the 1st MTPJ-sesamoid complex. We found the average crista distance to be 0.97 cm (9.7 mm) in width. Our patient presented with an enlarged crista distance of 1.30 cm (13.0 mm). Current literature has found the mean length of the interosseous ligament to be 6.66 mm and the mean width to be 6.21 mm in patients with hallux abductovalgus deformity [12]. Due to lack of research in literature, we suggest further studies to determine an average crista size. Recognition of anatomical variants in crista size can potentially help in diagnosis and treatment of injuries and pathologies of 1st MTPJ-sesamoid complex. A more concise treatment plan would have been fabricated with knowledge of the above information.

References

Table 1. Crista distance in cm for the 11 patients studied.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Crista Distance (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.94</td>
</tr>
<tr>
<td>2</td>
<td>1.12</td>
</tr>
<tr>
<td>3</td>
<td>1.96</td>
</tr>
<tr>
<td>4</td>
<td>0.99</td>
</tr>
<tr>
<td>5</td>
<td>1.01</td>
</tr>
<tr>
<td>6</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Results
The average crista distance of the 11 patients studied was determined to be 1.07 cm. In comparison, the patient in our case had a crista distance of 1.33 cm, which is a 0.36 cm difference from the calculated average crista distance.
# 7

Radiographic analysis of average crista size of FCNY patient population and case presentation of an anatomical variant.

Throy Austero, Virosch Dharmadasa, Rahim Lakhani, Marisa Giustiniano.

Mentor: Adam Falivene, DPM

Abstract

The purpose of this study is to show an anatomical variant of crista size through a case study and to determine an average value for crista size in adults by retrospective analysis of radiographic imaging of Foot Clinic of New York (FCNY) patients. A systematic literature review will be conducted to assess what is currently known about anatomical variants in crista morphology and how this affects treatment in patients with sesamoid apparatus injury.

References

VITAMIN D STATUS AND BONE HEALING

Alaa Zeizoun, Kavin Lombardi, Reema Noman, Joseph Abdellalak, Robert Riscica, Matrona Giakoumis, DPM

INTRODUCTION

Vitamin D plays an important role in calcium and phosphorus metabolism, and is integral to bone maintenance and repair processes in the human body [1]. Vitamin D deficiency has been documented in all races, age groups, and ethnic backgrounds, and it is estimated to affect more than 1 billion people worldwide [2]. Studies of various human populations have found hyperparathyroidism (<25 nmol/L) to range from 32% to 58% (1.4) from among higher latitude, vitamin D deficiency is common [7-9]. Vitamin D deficiency can possibly affect cardiovascular, fracture, and osteoporosis incidence rates, increase osteoporosis and place increased stress on care systems. Additionally, vitamin D deficiency can complicate muscle weakness, appetite, activation and induce neurological changes that can affect rehabilitation post-operatively [10].

The effect of vitamin D on maintaining bone health is well researched on a cellular level and its role in the various metabolic stages of bone healing has become evident. However, the clinical effects of vitamin D deficiency and supplementation on bone healing are less described and published results remain inconsistent [12]. The purpose of this study was to conduct a literature review and to report on the prevalence of hyperparathyroidism and vitamin D in a specific cohort of patients, and to simultaneously note if a link between low vitamin D levels and bone healing complications could be maintained.

METHODS

A retrospective chart review of all patients undergoing a minor and/or blunt fracture, knee joint arthroscopy, or knee joint fracture and/or open joint fixation between May 2018 and November 2018 was eligible for inclusion in this study. Exclusion criteria included concurrent medical and/or surgical procedures, were less than 1 month post-operative follow up, follow up at an outside facility using different electronic health record, and pre-operative diagnosis of any of the following: chronic respiratory, chronic lung, chronic liver, chronic kidney, and established chronic illness or infection. The definition of hyperparathyroidism was based on published recommendations [12]. Vitamin D level above 30 nmol/L, seen normal or sufficient levels in vitamin D levels were defined as levels between 25 and 50 ng/mL. Individuals with levels below 20 nmol/L, were considered deficient. It is not realistic to assess maturation for vitamin D levels who died for all patients prospectively. As a result, not every patient had an available Vitamin D level. No surgeries were delayed due to low vitamin D levels. No changes in surgical techniques were reported based on Vitamin D levels. The procedures involved in the study were history of the past (SA), clinical history (Ant.), and electrocardiography (ECG), electrocardiography (EKG), and electrocardiography (EKG), and EKG (ECG). Procedure also included open reductions and internal fixation (ORIF) of the ankle, elbow, and ankle. Finally, osteotomy of the calcaneus, medial or lateral displacement, and open reduction and internal fixation post-operative analysis were included.

All patients having the above procedures described, and identified using the ICD (International Classification of Diseases, 9th edition, codes, specific to procedures and to specific bone, as well as to complications involving bone healing, that evaluation utilized involved any article that was done on non-human studies, involved patients with osteoporosis, involved patients of surgical operations as well as any patients that had post-operative details of their conditions. After analyzing the inclusion and exclusion criteria, we narrowed down to 7 articles. Finally, we narrowed down the review based on the level of evidence, and chosen all articles that were prospective and randomized controlled trials, while osteoporosis and cases control studies were included. The final four articles left us with a sample size of 154 patients.

RESULTS

All patients were categorized by the presence or absence of bone healing. Outcomes were categorized as not improved or improved among groups using the chi-square test or student t test for categorized or continuous variables respectively. The hypothesis is that there is no difference in demographic, procedural, and clinical outcomes between the groups. The primary outcomes were muscle strength and self-reported function. Overall bone healing was observed in 24% (15.5%) of patients. No differences were found among demographic parameters, including age (<42 vs. ≥42: p=0.41; 15-65 vs. >65: p=0.30); gender (male vs. female: p=0.12); and smoking (<20 vs. ≥20: p=0.45). No differences were found in the biochemical markers or nutrition (14 (62.9%) vs. 13 (48.3%) p=0.1); Vitamin D deficiency rate was 22% (59.4%). Bone healing occurred in 10/22 (45.4%) of patients with vitamin D deficiency, in 5/13 (38.4%) of patients with 25-hydroxyvitamin D levels, seen normal or sufficient levels, and 0/15 (0%) of patients with vitamin D deficiency, in 5/13 (38.4%) of patients with 25-hydroxyvitamin D levels, seen normal or sufficient levels.

Table 1: Above: Characteristics of included studies that are not independent and include studies regarding Vitamin D and bone healing, fracture healing and osteoporosis

Table 2: Left: Study Characteristics

Thank you to Anker Therapeutics for his assistance with the statistical analysis.

DISCUSSION

When looking at the prevalence of hyperparathyroidism defined in this study as insufficient or deficient levels in our patient population, 22% (28.5%) with available serum vitamin D levels at hyperparathyroidism. Vitamin D levels were only available in 22% of the 25 total patients. Our findings support the expected high prevalence of hyperparathyroidism in patients with bone and muscle pathology [13].

Age of patient was identified at the time of fracture. The age groups of mean age for the patients was 56 years old, 15-19, 60-65, 65-70, and 70 or older. All patients with available vitamin D levels aged 40 or older had hyperparathyroidism [14]. Table 1 shows results. Table 2 identifies if ICD found no correlation with age and vitamin D level (these sub-groups, however, were examined differently).

Use of tobacco has also been documented to affect bone healing. Using a univariate analysis, tobacco was not related to fracture healing as this population p (0.13). Tobacco use was associated with increased bone mass compared to the fracture procedure and the femoral neck fracture procedure [15].

In the cohort of patients, bone healing was not affected by hyperparathyroidism, which was documented in 15/22 vitamin D deficient patients (p=0.8). Given that age, the patient had sufficient levels, and different analysis could not be performed.

Without being able to compare insufficient or deficient levels in patients with sufficient levels, interpatient intake of vitamin D intake, fracture healing, or osteoporosis, a correlation could not be established. Future studies may benefit from having a cohort group of vitamin D sufficient patients to compare against. It might also be interesting to see if supplementation in the non-operative period would affect bone healing.

We acknowledge some limitations within this report. Firstly, being an observational study, it was not possible to introduce any bias. The study attempted to identify the effects of hyperparathyroidism on bone healing, however, there was no control group that was not deficient at a sufficient vitamin D level. A comparison between fracture patients with vitamin D levels, seen normal or sufficient levels, and fracture patients with vitamin D deficiency, in 5/13 (38.4%) of patients with 25-hydroxyvitamin D levels, seen normal or sufficient levels, could not be performed.

Vitamin D deficiency has become a global health problem due to its role in important body functions. The benefits of Vitamin D supplementation or adequate vitamin D levels for the bone healing process are also demonstrated and have yet to be established. Review of the literature found that vitamin D status at time of fracture affects fracture healing [16]. High prevalence of vitamin D deficiency or serum deficiency was found in a general adult outpatient fracture population and in patients undergoing hip fracture and ankle arthroscopy. Our study did find that the rate of union was high and independent of supplementation with vitamin D. Another study found that vitamin D supplementation could improve patient condition 8 and 12 weeks after treatment. Further research is needed to

REFERENCES

Vitamin D Status and Bone Healing

Alaa Zeizoun, Kavin Lombardi, Reema Naman, Joseph Abdelmalak, Robert Riscica.

Mentor: Matrona Giakoumis, DPM

Abstract

Vitamin D is an integral player in bone formation, healing and remodeling through direct interaction with osteoblasts. Vitamin D deficiency is estimated to affect more than 1 billion people worldwide. The role of Vitamin D and maintenance of bone health is well researched on a cellular level and its role in the various metabolic stages of fracture healing has become evident. However, the clinical effects of a vitamin D deficiency and of supplementation on human fracture and arthrodesis healing are less well described and published, and results remain inconclusive. The purpose of this study was to conduct a literature review on the prevalence of hypovitaminosis D as well as the effect of hypovitaminosis D on bone healing. We also performed a retrospective chart review of 44 patients who underwent a major ankle or hindfoot arthrodesis or open reduction with internal fixation.

Method: We performed the following PubMed query using MeSH Terms; Vitamin d deficiency, fracture healing, bone healing, bone union. Then another query used: (vitamin d deficiency[MeSH Terms]) AND foot surgery)) OR vitamin D deficiency[MeSH Terms]) AND ankle surgery). We got 70 articles. We narrowed down the articles with our preset inclusion and exclusion criteria to 4 studies for review. Serum 25-hydroxyvitamin-D (vitamin D) levels were obtained prospectively in 44 elective patients undergoing elective foot and ankle surgery between May 2015 and November 2018. Variables including age, gender, vitamin D level, tobacco use, bone healing, and follow up length were recorded. Statistical analysis was performed using a significance level of P <.05.

Results: Prevalence of hypovitaminosis D in our patient population was one outcome measure. This study also attempted to show that fusion rates are affected by Vitamin D level.

Conclusion: Review of the literature found that vitamin D status at time of fracture affects fracture healing. A high prevalence of vitamin D deficiency or severe deficiency was found in a general adult outpatient fracture population. While two of the studies reviewed showed better union with vitamin D supplementation in the setting of deficiency. Another study showed that vitamin D supplementation during acute recovery period does not affect the rate of union and the rate of union was high and independent of supplementation with vitamin D. With this discrepancy in literature we think that further research is needed to confirm or disprove these results.

References
ABSTRACT

The incidence of type 2 diabetes continues to markedly increase year after year. The growing incidence is due to multiple factors that vary based on age, sex, ethnicity, geographic location, genetic, and comorbidities. One factor in particular that remains constant, however, is collectively, the response that appears in patients with uncontrolled diabetes. Specifically, those with uncontrolled diabetes are more likely to develop neovascular and peripheral vascular disease, and such in combination with elevated blood glucose levels lead to the development of skin ulcers that prove difficult to resolve. Debate remains ongoing as to the optimal treatment of diabetic wounds, especially those that present with nonhealing ulcers. Newer evidence has shown that, in addition to controlling blood glucose levels, the application of micrometals such as zinc and magnesium, both of which play critical roles in normal wound healing, may be an advantageous adjunctive therapy for wound care management.

INTRODUCTION

Incidence is on the rise worldwide in the case of wound care management. The focus on the optimization of wound care management is crucial in reducing the number of chronic, nonhealing wounds. The incidence of wound care management is highly dependent on the proper management of the underlying factors contributing to the development of diabetic foot ulcers. A systematic review and meta-analysis of randomized controlled trials (RCTs) that evaluated the use of topical zinc and magnesium for the treatment of diabetic foot ulcers showed a significant reduction in the ulcer size and improved healing outcomes. This review aimed to provide an overview of the current evidence on the use of topical zinc and magnesium for the treatment of diabetic foot ulcers.

METHODS

A PubMed database search was conducted and three papers were identified for our literature review. The search phrase “zinc” and “magnesium” was used to identify relevant studies. The inclusion criteria for the papers included in this review were randomized controlled trials with a minimum of six weeks of follow-up and a comparison group. The keywords used in the search included “zinc,” “magnesium,” “diabetic foot ulcers,” and “wound healing.”

RESULTS

The results of the systematic review and meta-analysis showed a significant reduction in the ulcer size and improved healing outcomes in patients with diabetic foot ulcers treated with topical zinc and magnesium. The meta-analysis included 101 participants in the experimental group and 99 participants in the control group. The mean reduction in ulcer size in the experimental group was 46.4% compared to 21.7% in the control group (p < 0.05). The results of the meta-analysis showed a significant difference in the healing outcomes between the two groups.

CONCLUSION

The results of this systematic review and meta-analysis suggest that topical zinc and magnesium may be beneficial in the treatment of diabetic foot ulcers. Further randomized controlled trials with larger sample sizes and longer follow-up periods are needed to confirm these findings.

REFERENCES


# 9

**The Role of Magnesium and Zinc in Woundcare Management**

Haidy Awad, Bethany DeMarco, Mohammed Gheith, Kaitlyn Testa.

Mentor: Javeria Hussaini, DPM

## Abstract

The incidence of type 2 diabetes is markedly increasing year after year. The increasing incidence is due to multiple factors that vary based on age, sex, ethnicity, geographic location, genetics, comorbidities, etc. One factor that remains constant is the sequelae that follows in patients with uncontrolled diabetes. Those with uncontrolled diabetes are more likely to develop neuropathy and peripheral vascular disease. Those factors, in combination with elevated blood glucose, lead to the development of foot ulcers that prove difficult to heal. Debate continues over the optimal treatment of diabetic wounds, especially in those that present with non-healing ulcers. Newer evidence has shown that, in addition to controlling blood glucose levels, application of micronutrients such as Zinc and Magnesium, both of which play critical roles in normal wound healing, may be an advantageous adjunctive therapy for wound care management.

## References

ABSTRACT

The mean age of the study subjects was 68.85 (SD = 10.64), 100% (n = 13) of the patients had a history of type II diabetes mellitus. 30.8% (n = 4) of the patients had a history of foot ulcers.

The correlation coefficient between SWMLeftAvg and VPTLeftAvg was .293. For SWMRightAvg and VPTRightAvg, it was .232. For ITLLeftAvg and VPTLeftAvg, it was .248. For ITLRightAvg and VPTRightAvg, it was -.147.

Direct comparison of the ITT and the SWMF for the right foot and left foot shows a correlation of .357 and .433 respectively. This correlation shows significant correlation between the ITT and the SWMF, with the VPT, there was no significant correlation between the ITT (r = .248, p = .413) or the SWMF (r = .293, p = .332) and the VPT (Table 1).

INTRODUCTION

Diabetes mellitus is a widespread disease affecting more than 300 million people worldwide. 1 One of the most common complications that arise in diabetic patients is diabetic peripheral neuropathy (DPN). The consequence of diabetes arises from increased blood glucose and its destructive effects on the body's nervous system. Patients will often present with complaints of tingling, burning, and shock-like sensations that affect their daily living. "There are many different modalities to evaluate and monitor the progression of DPN in a patient. The Semmes-Weinstein monofilament exam (SWMF) is the most commonly used technique to assess for the presence of DPN in the primary care setting. 2 The SWMF employs a 10-grain monofilament to test sensation at various pressure points on the foot. The monofilament test (MFT) is another tool to assess for DPN. 3 In contrast to the SWMF, the ITT is performed using only examiner's hands and involves fewer pressure points to test. 4 The ITT is a subjective examination that requires the examiner's perception. Vibration perception threshold (VPT) is currently the gold standard for diagnosing DPN. 5 The aim of this study is to assess the reliability of the ITT compared to the SWMF in evaluating DPN.

RESULTS

| Table 1. Correlations between the ITT and the VPT, and the SWMF and the VPT. |
|-----------------------|-----------------|-------------------|-----------------|
|                        | SWMF            | ITTLeft           | VPTLeft          |
|                        | MFT Left        | MFT Right         | MFT Right        |
| Correlation Coefficient | 0.323           | 0.314             | 0.314            |
| Significance (p-value)  | 0.018           | 0.018             | 0.046            |

REFERENCES

The Reliability of the Ipswich Touch Test compared to the Semmes-Weinstein Monofilament Exam

William Etts, Andrew Fischer, Kevin Jiang, Saul Rodriguez.

Mentor: Javeria Hussaini, DPM

Abstract

The Semmes-Weinstein monofilament exam (SWME) is the most commonly utilized tool to assess for the presence of diabetic peripheral neuropathy (DPN) in the primary care setting. The SWME employs a 10-gram monofilament wire to test sensation at various pressure points on the foot. The Ipswich touch test (ITT) is another tool to assess for DPN. In contrast to SWME, ITT is performed using only examiner’s hands and involves fewer pressure points to test. This method saves both time and expenses for additional equipment. Measurement of the vibratory perception threshold (VPT) is currently the gold standard for diagnosing DPN. The aim of this study is to assess the reliability of ITT compared to SWME in evaluating DPN.

References

THE ROLE OF WOUND CARE AND ENDOVASCULAR INTERVENTION IN HEALING LOWER EXTREMITY ULCERATIONS WITH VASCULAR COMPROMISE

Robert Karman, Aleksey Kozlov, Gabriel Cooper, Nicholas Banerjee, Anthony Iorio DPM

ABSTRACT

While traditional wound care modalities such as debridement, dressing changes, topical biologics, and negative pressure oxygen therapy have been instrumental in improving the prognosis of many wound patients, a subset of wounds demonstrating vascular compromise have proven to be resilient to these therapies. Recently, there has been a shift in utilizing surgical procedures to promote lower extremity perfusion as a means to promote wound closure. This retrospective study measured wound bed size in patients with peripheral vascular disease following treatment with vascular intervention alongside traditional wound care modalities. The study intends to examine the impact of vascular intervention and wound care in the treatment of ulcersations of patients with peripheral vascular disease.

METHODS

This investigation seeks to assess the effectiveness of various vascular interventions along with traditional wound care modalities in the treatment of lower extremity ulceration concomitant with peripheral vascular disease. Retrospective data from the Medallion Medical Health Services medical records was used to determine whether a statistically significant correlation exists between reduction in ulceration size following vascular intervention with concomitant wound care follow up. Data regarding initial ulcer size was gathered and correlated with the date of endovascular intervention (laser ablation, angioplasty, or venous ablation) and subsequent ulcer measurements. Ulcer size was measured upon initial patient presentation. Patients were treated solely with wound care therapies for approximately 2 months after which they underwent one of the three aforementioned vascular interventions by a vascular surgeon. Final measurements were taken at an average of 2 months following vascular intervention. In patients with multiple ulcerations, each ulceration was treated as its own individual data point. Data points were taken from a total of 19 lower extremity ulcersations according to their respective length and width at which total wound surface area was calculated. In our study we calculated an average of 78.13 cm² (21.3) surface area reduction 4 months after initial wound care and 2 months after vascular intervention. Every patient received both traditional wound care as well as surgical vascular intervention and wound bed size was measured approximately 2 months after the vascular procedures.

CONCLUSION

This study demonstrates the effectiveness of concomitant utilization of traditional wound care modalities alongside surgical interventions such as venous ablation, laser atherectomy, and angioplasty. Our study demonstrates that every enrolled wound patient with peripheral vascular disease experienced a decrease in wound bed size following therapy. Vascular intervention proves to be an essential part of ulceration management in wounds demonstrating vascular compromise. Further studies are required to ascertain the specific role and impact of such vascular intervention with control populations receiving only traditional wound care therapy. Future long-term studies are required to evaluate the recurrence of ulcerations and re-estenosis after vascular intervention.

REFERENCES


A special thanks to the staff and physicians of MedAlliance located in Farmington South, Bronx, New York especially Dr. Patricia Memon DPM, Dr. Juan Garcia MD, FACC, and Dr. Corey Goldman MD, PhD without which this study would not be possible. In addition the authors of this study would like to thank the faculty and staff of NYCPC for their assistance in this study.

Figure 3: Pre-treatment - 100% distal stenosis of superficial femoral artery

Figure 4: Pre-vascular intervention wound bed measuring 3.5 cm x 0.7 cm

Figure 5: Post vascular intervention wound bed measuring 3.2 cm x 0.8 cm

Figure 6: Pre-vascular intervention wound bed measuring 3.5 cm x 4.0 cm

Figure 7: Post-treatment - 100% distal stenosis of superficial femoral artery

Figure 8: Wound Size Measurement Tool
# 11

The Role of Woundcare and Endovascular Intervention in Healing Lower Extremity Ulcerations with Vascular Compromise

Robert Karman, Aleksey Kozlov, Gabriel Cooper, Nicholas Banerjee.

Mentor: Anthony Iorio, DPM

Abstract

While traditional wound care modalities such as debridement, dressing changes, topical biologics, and negative pressure oxygen therapy have been instrumental in improving the prognosis of many wound patients, a subset of wounds demonstrating vascular compromise have proven to be resilient to these therapies. Recently, there has been a shift in utilizing surgical procedures to promote lower extremity perfusion as a means to promote wound closure. This retrospective study measures wound bed size in patients with peripheral vascular disease over a set period of time following vascular intervention alongside traditional wound care modalities. The study intends to examine the impact of vascular intervention in the treatment of ulcerations of patients with peripheral vascular disease.

References


Second MTPJ Dysfunction: Do We Have the Answer?
Kevin Jules DPM, Sanjana Sanghvi, Priya Patel, Sruti Karwa, Rebecca Mina, YuFei Cao

Abstract

Introduction: The planter plate is a crucial stabilizing component of the metatarsophalangeal joint (MTPJ). Planter plate tears are most common at the 2nd MTPJ and result in pain, instability, weakness, deformity, and dysfunction. Often, conservative measures fail to provide adequate relief or correction of 2nd MTPJ dysfunction necessitating surgical intervention. There are various surgical approaches for planter plate repair. This literature review aims to address four generated surgical approaches for plantar plate repair along with various intervention techniques such as dorsal direct repair, a long flexor or short flexor tendon transfer with a synthetic anker, suture button or a complete plantar plate repair (PPP) system with an Achilles, Scorpion or Viper system.

Methods: A PubMed search was performed for the MeSH term “stress metatarsophalangeal joint surgery.” Search results were filtered to include articles from the last 10 years with human subjects and with the full text available. This yielded 120 articles, which were sorted into those most relevant to “plantar plate repairs,” “surgical repair techniques,” “plantar plate tears,” and “surgical techniques for plantar plate repair.” Articles based on “surgical treatment for fractures” and articles with “systemic issues” (i.e., rheumatoid arthritis, fibroids) were excluded. In total, nine articles were selected to be reviewed.

Results: The PubMed search yielded 120 articles, from which articles were evaluated after inclusion and exclusion criteria were applied.

Discussion and Conclusions: There are various surgical approaches for plantar plate repair for 2nd MTPJ dysfunction, ranging from soft tissue transfers to direct repair with osseous methods. The dorsal incision approach is associated with good visualization of the plantar plate, decreased risk of wound dehiscence, and a greater risk of possible fracture of the proximal phalanx. It is suggested that flexor to extensor transfers may eliminate sagittal plane instability without an osteotomy. The suture-button technique is effective in stabilizing the plantar plate and MTPJ after failed digital surgery. A CPM® can restore normal alignment of the joint through reconstruction. Though, there is no “best” surgical option for 2nd MTPJ dysfunction, lesion location tends to be reduced soft tissue approaches, while greater deformities may need osseous procedures.

Table 1: Article Summaries

<table>
<thead>
<tr>
<th>Reference</th>
<th>Technique</th>
<th>Study Design</th>
<th>Surgical Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen et al.</td>
<td>Surgical approach</td>
<td>Systematic review</td>
<td>Open dorsal repair, suture button repair</td>
</tr>
<tr>
<td>Li et al.</td>
<td>Surgical approach</td>
<td>Case series</td>
<td>Open dorsal repair, suture button repair</td>
</tr>
<tr>
<td>Wang et al.</td>
<td>Surgical approach</td>
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<tr>
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<tr>
<td>Chen et al.</td>
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<tr>
<td>Zhang et al.</td>
<td>Surgical approach</td>
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<td>Li et al.</td>
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</tbody>
</table>

Table 2: Advantages and Disadvantages of Various Planter Plate Repair Techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open dorsal repair</td>
<td>Direct visualization of acute or chronic injury, and elimination of mimicking an arthroscopic injury</td>
<td>Time consuming due to the need for a dorsal incision</td>
</tr>
<tr>
<td>Long flexor tendon transfer (Cheney)</td>
<td>Significantly increases stability of the MTPJ in supine position, with the foot in neutral position</td>
<td>The procedure is time-consuming and requires an extended incision</td>
</tr>
<tr>
<td>Suture button</td>
<td>Does not detach the plantar plate, no bone tunneling, and avoids the need for the use of metatarsal bridge</td>
<td>No significant changes in stability of plantar flexion or extension</td>
</tr>
<tr>
<td>Complete plantar plate repair (CPTR™)</td>
<td>Can be used in tight spaces with or without a shunt takedown</td>
<td>Requires a longer incision and more extensive dissection</td>
</tr>
</tbody>
</table>

Figure 1: Method for PubMed Literature Search

Figure 2: Table 1: Advantages and Disadvantages of Various Planter Plate Repair Techniques

Conclusions

The plantar plate of the 2nd MTPJ is the most commonly torn in the lesser MTPJs. There are many effective surgical approaches to treat MTPJ dysfunction. These range from soft tissue transfer direct repair to osseous methods. It is most commonly observed in the metatarsal heads and the proximal phalanx. In the majority of cases, the MTPJ is involved with a dorsal direct repair, a long flexor or short flexor tendon transfer with an anker, suture button, or a complete plantar plate repair (PPP) system with an Achilles, Scorpion or Viper system.

References

Second MTPJ dysfunction: Do we have the answer?

Sanjna Sanghvi, Priya Patel, Sruti Karwa, Rebecca Mina, Yufei Cao.

Mentor: Kevin Jules, DPM

Abstract

The plantar plate is a crucial stabilizing component of the metatarsophalangeal joint (MTPJ). Plantar plate tears are most common at the 2nd MTPJ, and result in pain, instability, weakness, deformity, and dysfunction. Often, conservative measures fail to provide adequate relief or correction of 2nd MTPJ dysfunction, necessitating surgical intervention. There are various surgical approaches for plantar plate repair. This literature review aims to address four generalized surgical approaches for plantar plate repair alongside a metatarsal osteotomy: open dorsal direct repair, a long flexor or short flexor tendon transfer with a synthetic anchor, suture button or a complete plantar plate repair (PPR) system such as Arthrex Scorpion or Viper system.

Methods: A PubMed search was performed for the MESH term “lesser metatarsophalangeal joint surgery.” Search results were filtered to include articles from the last 10 years, with human subjects, and with the full-text available. This yielded 125 articles, which were sorted to choose those most relevant to “plantar plate repairs,” “surgical repair techniques” specifically. Articles based on “gait and/or tendon transfers for contractures” and articles with “systemic issues” (i.e. rheumatoid arthritis, Freiberg's) were excluded. In total, nine articles were selected to be reviewed.

Results: The PubMed search yielded 125 articles. Nine articles were evaluated after inclusion and exclusion criteria were applied.

References

THE PREDICTIVE VALUE OF A GRAM STAIN FOR DIAGNOsing LOWER EXTREMity INFECTIONS

Ella Choi BS, MA, Christopher Hahn BSc, BA, Janet Jeong BA, Laurel Yee BA, Sandra Zawadka BS, Mark Kosinski DPM.

INTRODUCTION

Gram staining is a technique used to rapidly differentiate bacteria based on their morphological features of their cell wall, and is used alongside culture and sensitivity (C&S) reports to start early, appropriate treatment.

Gram stain is simple, rapid, and inexpensive to perform. The procedure consists of applying a primary stain—usually crystal violet or other basic fuchsin—on a heat-fixed smear of clinical specimen or bacterial culture on a glass slide. The slide is rinsed with alcohol; the Gram-negative organisms are stained pink due to their inability to retain the crystal violet stain, while Gram-positive organisms retain the crystal violet stain. This is then followed by a Gram removal step, which is performed utilizing acetone or alcohol. Lastly, the slide is contrasted with either safranin or basic fuchsin. Gram-positive bacteria, which have a thick cell wall, will retain the crystal violet stain and appear purple. On the other hand, Gram-negative bacteria which has a relatively thin cell wall, will not retain crystal violet stain but will take up the counterstain and appear pink. This can often be performed manually or by an automated process.

Because it is a rapid procedure, a Gram stain is useful in predicting the species of bacteria (Gram positive or Gram negative) in a wound before definitive culture and sensitivity results are known. An accurate Gram stain can be useful in selecting appropriate antibiotic therapy early. An inaccurate Gram stain can provide misleading information and delay treatment.

Our study sought to determine the predictive value of a Gram stain in uncomplicated skin and soft tissue infections. If the results are accurate, one could then rely on a Gram stain to direct antibiotic therapy.

METHODS

A review was conducted of all culture and sensitivity reports received from the三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三三three laboratories in the Food and Drug Administration in New York. All patients were classified as mild and uncomplicated skin and soft tissue infections. All patients were from the food and drug administration in New York.

All cultures were collected from the Food and Drug Administration in New York using an swab (xenith isolate) and transported within 24 hours to the hospital laboratory (infectious disease). This allowed the capability of supporting the growth of both aerobic and anaerobic and fastidious bacteria. Slides for Gram stain were prepared using the automated PRENA Color Gram System. Culture and sensitivity were obtained using the Eiken MS 2.

Predictive scores were assigned to each report based on how accurately the Gram stain results correlated with C&S report. Each report was scored using the following system:

Predictive Scores:
1 = Fully predictive. All organisms present and accounted for
2 = Partially predictive. More organisms seen on Gram stain than grew in culture (overpredictive)
3 = Nonpredictive. More organisms seen on Gram’s stain than grew on culture (underpredictive)

RESULTS

Two hundred and twelve reports from 172 patients were reviewed. Of these, seventy-eight (35.2%) were performed while the patient was receiving antibiotics, at which time the results were found in the C&S. Only one patient was seen in which the presence of WBCs (polys) on the Gram stain, sensitivity, specificity and positive, negative predictive values were calculated. (Fig 1)

In order to determine the extent to which the pediatric community utilizes Gram stains, we asked Dr. Barry Black to conduct a survey in the UK. We found that 37.1% of children and 60.3% of patients had a Gram stain performed. These results were compared to our previous results. (Fig 2)

Positive predictive value

Of the 212 reports, 139 reports showed full Gram stain and culture and sensitivity. A total of 74% (139 reports) were found to be positive. Either all organisms on Gram’s stain were grown in culture or if there were no organisms seen on Gram’s stain, nothing grew on culture. The proportion of fully concordant reports between Gram stain and culture and sensitivity results was 85.9%. (Fig. 2) Overall, Gram stain was found to be effective in diagnosing infections and providing empirical antibiotic treatment (95% confidence interval (CI)) (0.76-0.41). Furthermore, the sensitivity of Gram staining was found to be 80.7%, and the specificity was 37.14%

Disconcordance

Any report that showed growth on both Gram stain and culture, but with different amounts of organisms grown was found to be non predictive. If any report that showed no growth in either culture or culture was found to be non predictive, there were a total of 51 reports that showed only partial concordance (7.8%). (Compared to the 51 reports that showed no concordance, there were 42 reports (82.5%) that showed concordance. In addition, there were 24 reports classified as non predictive. All non predictive reports showed no growth on Gram stain, but growth on culture.

Effect of antibiotics

In this analysis, the reports that indicated the patient was taking antibiotics prior to the time the culture was taken (26 total reports), 54.1% (16 reports) were found to be concordant with culture results. Though this proportion is lower than that of the overall population of reports, this analysis was unable to show a statistical difference between the two (0.76-0.41, P=0.37).

Presence of white blood cells on C&S

There was a significant reduction in the proportion concordant reports in this population at 57.1% (4 reports out of 7). However again there was no significant difference between the two (0.76-0.41, P=0.37).

CONCLUSIONS

Since Gram stain and C&S results did not show a full concordance, Gram stains should not be seen as a sole determining factor in choosing an empirical antibiotic to treat mild infections. Their value however may be as an adjunct.

In future studies, we hope to assess their value in moderate to severe infections where a larger specimen size and a larger cohort of patients can be studied.
# 13

The Predictive Value of Gram’s Stains in Diagnosing Lower Extremity Infections

Ella Choi, Christopher Hahn, Janet Jeong, Laurel Yee, Sandra Zawadka.

Mentor: Mark Kosinski, DPM

Abstract

Gram staining is a laboratory technique used to differentiate bacteria based on the morphological features of their cell wall. Because it is a rapid procedure, a Gram stain is useful in predicting the species of bacteria (Gram positive or Gram negative) present in an infected wound before definitive culture and sensitivity results are known.

An accurate Gram stain can be useful in guiding appropriate antibiotic therapy. An inaccurate Gram stain can provide misleading information and delay treatment.

Our study sought to determine the reliability of a Gram stain in predicting the bacterial organisms which would eventually be reported on a culture and sensitivity report. In other words: Is a Gram stain reliable?

A retrospective study was conducted on all culture and sensitivity reports received from Bako Laboratories from 2013 to 2018 (n=212). All reports had an accompanying Gram stain. All infections were classified as mild and were obtained with the use of a swab culturette.

Predictive scores were assigned to each report based on how accurately the Gram stain results correlated with C&S report. Variables analyzed included concurrent antibiotics (if any), the site and severity of infection and the presence or absence of white blood cells on the Gram’s stain.

References

INTRODUCTION

Morton's neuroma is a common condition affecting middle-aged women. There are many proposed etiologies for the lesion, including chronic repetitive trauma, ischemia, entrapment, and intermetatarsal bursitis. The term "neuroma" implies ucs pathology in a nerve trunk, although histological examination reveals the lesion to be an inflammatory process—likely chronic, intermetatarsal fibrosis. The common digital nerve and its branches in the third planter interstice are most commonly affected. The chief complaints are a burning and tingling sensation, down the interprobe of the involved toes, worsened by walking in high-heeled shoes with a narrow toe box. Symptoms are generally relieved by rest and removal of the shoe. Diagnosis is usually made through history taking and clinical examination, but may be aided by ultrasonography and magnetic resonance imaging (MRI). The purpose of this study was to conduct a literature review to evaluate the various imaging modalities used to assess nerve entrapment in the foot—specifically, Morton's Neuroma. The results of the literature review are summarized in Table 1. The authors used the results of the literature review to recommend an algorithm using diagnostic-imaging modalities to aid the clinician in diagnosing Morton's Neuroma (Figure 1). The typical appearance of Morton's Neuroma on both MRI and ultrasonography is demonstrated in Figure 2.

REFERENCES


# 14

Diagnostic Imaging of Nerve Entrapment in the Foot: Clinical Recommendations

George Abadeer, Mino Abdelmessih, Amira Bekhit, Joseph Dobbs, Wesley Nesbit.

Mentor: Stephanie Maurais, DPM

Abstract

One common example of nerve entrapment is Morton’s neuroma. Patients usually report burning and tingling sensations around the interspace of the involved toes, worsened by walking in narrow toe box shoes. Patients may find relief of their symptoms by rest and by removing their shoes. Other proposed etiologies for this condition, which include: chronic repetitive trauma, ischemia, and intermetatarsal bursitis. Incorrect terminology suggests that the underlying pathological process is a nerve tumor, although histological examination reveals the presence of inflammatory tissue—that is, perineural fibrosis. Diagnosis is usually made via a thorough patient history and clinical examination; however, accurate clinical diagnosis is often difficult. Radiographic studies (such as x-ray, ultrasonography, and MRI) are commonly performed in order to differentiate neuralgia from other causes of forefoot pain.

References


5- P.P. Shapiro, S.L. ShapiroSonographic evaluation of interdigital neuromas ,Foot Ankle Int, 16 (1995), pp. 604-606


AN ALTERNATIVE INCISIONAL APPROACH FOR THE MANAGEMENT OF ADDUCTOVARUS DIGITAL DEFORMITIES

Rupinder Kaur Boora, Michael Fox, Navdeep Bains, Jaskern Dhami, Susan Rice DPM

Abstract

Our modified surgical approach entails a linear incision from the fifth MPJ to the fifth digit DIPJ (fig. 1 and 2). The fascia is released both at the PIPI and DIPJ of the fifth digit. Following the fascia release, an extensor tenotomy of the EDL is performed at the PIPI followed by a release of the collateral ligaments, with the lateral collateral ligament being freed before the medial collateral ligament. Next, the EDL tendon to the fifth digit is freed completely.

Triplanar correction of the deformity is achieved using the position of the fifth nail relative to the nail of a fourth digit that is in triplanar alignment (fig. 4). This is accomplished by drawing a line extending from the AYMR, to the DQN, of these digits and assessing their relationship pre and post correction to see if parallelism has been achieved (fig. 9).

Methods/Results

Our goal is to introduce a modified incisional approach to the Z-plasty method that achieves triplanar correction of an adducto-varus digital deformity following a fifth digit amputation. Following the arthroplasty, the digit is manually de-reoted and redundant skin from the digital medial and the proximal lateral aspects of the incision is identified. The tearal incision is converted to a V-to-Y flap and triangular flaps are made from the redundant skin which are then removed. This allows for shortening and complete rotation of the digit.

Triplanar correction is quantified pre and post operatively by assessing the position of the fifth nail relative to the nail of a fourth digit properly aligned in the frontal plane. While previously described off-plane techniques are often successful in achieving correction of the deformity, it is our belief that they do not always provide adequate correction to be frontal plane, which is necessary for the correction of the deformity. Therefore, it is our goal to describe a modified incisional approach to these techniques that allows for sufficient correction to be frontal plane. This modification of the EDL tendon is then sutured into the retracted collateral ligament in a manner where it allows for shortening and complete rotation of the digit. Triangular flaps are made from the redundant skin and excised allowing for shortening and complete rotation of the digit. Porcelain connector is inserted using the position of the fifth digit nail relative to the nail of a lesser digit nail that is in proper alignment in all three planes.

Conclusion

Our modified approach provides a significantly different surgical technique in achieving correction of the deformity to an extent. It is our belief that this technique fails to achieve correction to the frontal plane, which allows for sufficient correction of the deformity. We believe that our modified Z-plasty method may serve as a superior alternative to traditional skin paddles as it is able to achieve complete triplanar correction as demonstrated in the case presented.

References


An Alternative Incisional Approach for the Management of Aductovarus Digital Deformities

Rupinder Kaur Boora, Michael Fox, Navdeep Bains, Jaskern Dhahi.

Mentor: Susan Rice, DPM

Abstract

Fifth toe adductovarus deformities make up a large percentage of deformities seen by podiatrists. The etiologies range anywhere from congenital foot malformation to poor shoe gear. However, majority of these deformities are developmental, a consequence of biomechanical abnormalities and pathologic compensation mechanisms that the foot employs to mitigate them. Poor biomechanics can result in pathologic forces acting on the foot that cause the digits to go into adduction and varus. This places excess strain on the extrinsic muscles, which can no longer resist rotational forces. This gives the intrinsic musculature a mechanical advantage that can contribute to triplanar deformities, particularly in the fifth digit. Patients with an adductovarus deformity often require surgical correction in three planes: frontal (varus), sagittal (dorsiflexion) and transverse (adduction), with majority of correction needed in the frontal plane. Clinically, patients present with painful hyperkeratotic lesions at the proximal interphalangeal and distal interphalangeal joints.

Surgical correction consists of a digital arthroplasty and concomitant de-rotational soft tissue procedure. Current soft-tissue procedures currently utilized include skin-lengthening plasties such as the V-Y and Z-plasty, and purely de-rotational skin-plasties such as the semi-elliptical wedge. While these procedures achieved success in correction of the deformity, we believe that they do not always provide adequate correction in the frontal plane. Therefore, it is our goal to introduce a modified incisional approach to the Z-plasty method that achieves full frontal plane correction of adductovarus following a 5th digit arthroplasty. Our method is a soft-tissue shortening procedure that involves making a reverse Z-shaped linear incision along the dorsum of the 5th digit, extending from the MPJ to the DIPJ. Triangular flaps made from the distal and proximal arms are cut out to allow for derotation. Planar correction is quantified using the position of the fifth digit nail relative to the nail of a lesser digit nail that is in proper alignment in all three planes.

References

Primary Repair of the Deltoid Ligament Following Ankle Fractures to Prevent Medial Ankle Instability: Why or Why Not?

Aishma Choudhary BS BA, Tinisha Hicks BS, Yumma Siddiqui BS, Reem Sheikh DPM, AACFAS

Introduction

Ankle fractures are a common form of lower extremity trauma and tend to be more common if there is disruption of the deltoid ligament complex injury to the deltoid ligament complex is noted to be in nearly 46% of ankle fractures. Deltoid ligament injuries are consistent with Weber B and C fractures along with Lauge-Hansen supination-external rotation (SER) pronation-abduction (PA), and pronation-abduction external rotation (PER) fractures. Of these, SER injury is the most common cause of trauma to the deltoid ligament. The deltoid ligament is a fan-shaped, multilobed complex consisting of superficial and deep components. The superficial component originates from the medial malleolus and inserts on the medial aspect of the tibia. The deep component of the deltoid ligaments from the medial malleolus and inserts on the medial aspect of the tibia. It only crosses the ankle joints and consists of the Anterior and Posterior Talaris Ligaments. The superficial and deep layers of the deltoid ligaments are the primary restraints to valgus stress of the talus, while the deep layer is also responsible for preventing external rotation of the talus. Together, the various parts of the deltoid ligament complex help provide medial ankle stability.

As the deltoid ligament complex is a crucial stabilizer of the ankle joint, particular attention must be paid to the surgical technique. If left untreated or inadequately reduced, irreparably damaged, or unstable, surgical intervention may be required. Various methods of surgical repair or reconstruction may be performed, including (1) direct repair with fresh autograft using an arthroscopic approach, (2) modified techniques of anterior displacement, (3) surgical reconstruction using either the posterior tibialis tendon or the hamstrings tendon, or (4) construct augmentation techniques using lateral ligamentous or peroneal tendons.

Methods

Two independent search queries were performed in PubMed and ScienceDirect. The PubMed search was conducted using ‘deltoid ligament AND medial ankle instability’. Inclusion criteria required articles to be published in English between the search date of 01/01/2000 and 03/2019 and to include only human subjects. The search results were limited to Medline only. These criteria were applied to identify studies on the topic of deltoid ligament injury and its repair.

Discussion

Disruption of the deltoid ligament complex allows lateral migration of the talus or a shift within the mortise. Such anatomic realignment can cause alterations in proper biomechanical function of the ankle joint. Long-term sequelae of untreated deltoid ligament tears may include chronic lateral subluxation of the talus, pes planus, chronic ankle injury, and early diastasis arthroses.

Sun et al. performed a comparative cohort study in which they found no significant difference in median clear space, clinical, or functional outcomes between groups that had and had not undergone DLR. Li et al. performed a comparative cohort study on patients with SER IV ankle fractures that underwent ORIF with transarticular external fixation (TEF), but no DLR. After follow-up of 63 months, all patients had a significantly improved AOFAS ANK and VAS scores. The authors concluded that ORIF with TEF can achieve satisfactory outcomes when the need for DLR is not met. Deltoid ligament tear repair surgery for ankle fractures either with or without DLR then showed that four of five studies showed maintenance of reduction and ankle stability regardless of whether or not the deltoid ligament was repaired.

Conclusion

In conclusion, about 70 percent of the literature reviewed supported deltoid ligament repair and 30 percent performed formal ankle repair. Recent studies reveal many instances of primary DLR holding superior clinical and radiographic outcomes using the AOFAS and VAS. However, it is important to note that deltoid ligament injury is relatively common with longstanding hindfoot deformities and forefoot abduction. Improper treatment of the medial ankle, whether or not surgical repair, is likely to result in unfavorable long-term sequelae. A limitation of the literature review was that the selection of studies was determined by functional outcomes rather than surgical outcomes. Due to the recent emergence of deltoid ligament consideration in ankle repair, the decision to repair the deltoid ligament is still left to the discretion of the clinician.

References

[Provide a list of references here.]
Primary Repair of the Deltoid Ligament Following Ankle Fractures to Prevent Medial Ankle Instability: Why or Why Not?

Ashima Choudhary, Tinisha Ricks, Yumna Siddiqui.

Mentor: Reem Sheikh, DPM

Abstract

Ankle fractures are a common form of lower extremity trauma and tend to be more serious if there is disruption of the deltoid ligament complex. Injury to the deltoid ligament complex is noted to be in nearly 40% of ankle fractures.[1] Deltoid ligament injuries are consistent with Weber B and C fractures along with Lauge-Hansen supination-external rotation (SER), pronation-abduction (PAB), and pronation-external rotation (PER) fractures.[2] Out of these, SER injury is the most common cause of trauma to the deltoid ligament.[3] As the deltoid ligament complex is a crucial stabilizer of the ankle joint and in particular restricts displacement of the talus, if left untreated or inadequately reduced, the long-term sequela includes medial ankle instability. Current literature debates whether surgical repair or conservative management of the deltoid ligament provides better patient outcomes in the long-term. This systematic review attempts to offer evidence-based treatment guidelines and recommendations regarding deltoid ligament repair following an ankle fractures.

References


Effect of pH on Rate of Chronic Wound Healing: A Single Center Non-Randomized Prospective Study
Arthur Tarricone MPH, Karla De La Mata BS, Joseph S. Coppola BS, Samantha Landau DPM, Ronald Soave DPM
New York College of Podiatric Medicine, New York, NY

Introduction
Approximately 19% of the United States population has diabetes. Of these 10%, 25% are at risk for developing a diabetic foot ulcer (DFU). Diabetic foot ulcers often present with multiple comorbidities and present a multi-disciplinary challenge to heal. Current standard of care for wounds that fail to demonstrate >50% of wound healing after 4 weeks can be considered for adjunctive therapy, including biologic skin substitutes (BSS) and hyperbaric oxygen therapy. The use of biologic skin substitutes can cost up to US $30,000 per wound and a full course of hyperbaric oxygen therapy can cost up to US $300,000 per wound.6,7 The costs to treat DFUs is greater than US $1 billion dollars annually.5 Despite the financial investment, current therapies have shown limited success in decreasing morbidity, mortality, and amputations. Research has shown that alkaline pH is associated with a delay in wound healing, however pH-directed therapy to lower the wound pH is limited.3,5 This study sought to evaluate the effect of pH on chronic wound healing.

Objectives
Evaluate the relationship between pH and chronic wound healing rate.

Methods
A single center non-randomized prospective study of consecutive patients with chronic diabetic foot ulcers defined as a wound that fails to demonstrate >50% of wound area reduction after a minimum of 4 weeks of standard therapy were enrolled. All patients were consented in accordance with the Declaration of Helsinki. Standard debridement was performed for each patient. Following debridement, the wound was measured with a standard ruler and recorded. Following the measurement, the wound pH was measured using pH test strips and pH was recorded. pH-directed therapy was then applied. If alkaline, non-sterile gauze was soaked in 0.25% acetic acid and applied to the wound bed. If acidic, normal saline was used to rinse the wound. Following application of acetic acid or normal saline, standard therapy decided by the treating physician was applied. All patients were seen at four weekly intervals where standard debridement, wound measurement, and pH-directed therapy was applied. All patients were given acetic acid or normal saline and instructed to apply with each dressing change. Compliance was assessed by research staff at study intervals.

Results
Sixteen wounds across eight patients were enrolled. 16/16 wounds were measured to be alkaline with pH average (8.25 ± 0.55). The pH of the chronic wounds ranged from 7.5 - 9. Average area of the wound at the time of enrollment was 205.48 mm² ± 436.88 mm², average age of the wound 37.5 months ± 20.3; each wound demonstrated failure to heal greater than 50% in the previous 30 days prior to enrollment. Eleven wounds were treated with an unna boot, three were treated with Profore, two were treated with betadine and DSD. One patient received topical oxycytherapy in addition to the unna boot. All patients were treated with 0.25% acetic acid wash at each dressing change as the pH of the microenvironment was found to be alkaline in every case. A simple linear regression model was used to evaluate the linear relationship between change of pH and rate of wound healing. A correlation coefficient of 0.61 was found representing a moderate linear relationship between pH and wound healing.

Change in pH of Microenvironment and Wound Size (mm)

Baseline | Week 4
--- | ---
WoundMatrix | WoundMatrix
WoundM | WoundM

Conclusions
1. Chronic non-healing wounds tend to have an alkaline pH.
2. An acidic pH microenvironment was found to be favorable for the healing of wounds.
3. For every 1 unit in pH reduction, we can expect to see a reduction in wound size by 116.05 mm.
4. A moderate linear relationship between rate of wound healing and pH of the microenvironment was observed.
5. The application of products designed to lower the pH of the microenvironment may aid in healing chronic diabetic wounds.

References
Effect of pH on Rate of Chronic Wound Healing: A Single Center Non-Randomized Prospective Study

Arthur Tarricone, Karla De La Mata, Joseph S. Coppola, Samantha Landau.

Mentor: Ronald Soave, DPM

Abstract

Approximately 10% of the United States population has diabetes. Of these 10%, 25% are at a risk for developing a diabetic foot ulcer (DFU). Diabetic foot ulcers often present with multiple comorbidities and present a multi-disciplinary challenge to heal. Current standard of care for wounds that fail to demonstrate >50% of wound healing after 4 weeks can be considered for adjunctive therapy, including biologic skin substitutes (BSS) and hyperbaric oxygen therapy. The use of biologic skin substitutes can cost up to US $30,000 per wound and a full course of hyperbaric oxygen therapy can cost up to US $200,000 per wound. The costs to treat DFUs is greater than US $1 billion dollars annually. Despite the financial investment, current therapies have shown limited success in decreasing morbidity, mortality, and amputations. Research has shown that alkaline pH is associated with a delay in wound healing, however pH-directed therapy to lower the wound pH is limited. This study sought to evaluate the effect of pH on chronic wound healing.

References

INTRODUCTION

Purpose of the study:
The aim of this study is to investigate the possibility of accurately predicting proximal musculoskeletal complaints by measuring static ground reaction forces of the foot.

Background:
Musculoskeletal pain including knee, lower back, hip, shoulder and neck pain are common complaints that can lead to decreased quality of life and substantial disability (1-6). While musculoskeletal pain can be isolated to one area, it is common to see this pain in multiple areas. For example, both men and women with bilateral foot pain have been shown to have increased odds of suffering from knee and hip pain (7). One explanation for this observation is that the pathway of movement is connected in our body. Hence, when one part of the body is affected, the rest of the body is also affected by the pain. Hip pain and knee pain are common musculoskeletal complaints that affect 11.3% and 22.4% of the elderly population respectively (8). Studies have not only shown that there is a link between knee osteoarthritis and foot biomechanics. However, footwear modification has been shown to improve osteoarthritis outcomes (9). Modifying the ground reaction forces on the foot during gait by changing the center of pressure on the foot and continuous perturbation has also shown to decrease knee adduction moment and reduce knee pain due to osteoarthritis (10). Furthermore, people withiffer factor feasibility have higher overall ground reaction forces during running and can be used to assess susceptibility to foot and proximal injuries affecting the knee, hip and back pain (11).

Chronic orthopedic diseases are a leading cause of disability and can be a major cost to both patients and the overall economy (12). It has been shown that abnormal biomechanics that cause abnormal load on articular cartilage is related to the progression osteoarthritis (12).

METHODS

200 participants with varying age, gender and race were recruited for this study. All subjects were asked to come to the study. Inclusion criteria included patients from the ages of 18 to 100 with current complaints of either knee pain, hip pain, lower back pain, shoulder pain, neck pain or any combination thereof. All participants were asked to complete a questionnaire before examination to identify the location, frequency and level pain using a Wong Baker Face Scale. Exclusion criteria included a known history of alcohol or drug abuse in the previous year and elective oseous procedures performed within 30 days prior to screening. Participants that meet all inclusion and exclusion criteria were asked to undergo static gait analysis utilizing the Aetrex gait analysis system. Participants stood on an Aetrex plate for ten (10) seconds while plantar ground reaction forces were recorded. After capture of plantar ground reaction forces, participants were asked by evaluators if any complications occurred during the evaluation and any adverse events reported by the subject were recorded. Cash compensation was given to participants who completed the study. IRB approval for the study was obtained by Salus IRB Austin, Texas, and informed consent was given by all subjects. Study objectives and methods were explained to all subjects. This study was registered in the NIH clinical trials database.

The goal of the study was to investigate the possibility of accurately predicting proximal musculoskeletal complaints by measuring static ground reaction forces of the foot. The participants stood on an Aetrex plate for ten (10) seconds while plantar ground reaction forces were recorded. After capture of plantar ground reaction forces, participants were asked by evaluators if any complications occurred during the evaluation and any adverse events reported by the subject were recorded. Cash compensation was given to participants who completed the study. IRB approval for the study was obtained by Salus IRB Austin, Texas, and informed consent was given by all subjects. Study objectives and methods were explained to all subjects. This study was registered in the NIH clinical trials database.

PRELIMINARY RESULTS

Age Distribution

Figure 1: Age distribution

Distribution of Diagnosed vs Reported Complaints

Figure 3: Distribution of self reported pain separated by location and laterality of pain compared to predicted pain based on plantar ground reaction forces

Number of Levels Reported

Figure 2: Self-reported pain divided into 3 orthopedic levels of knee pain, hip/lower back pain and shoulder/upper back/neck pain

Figure 4: Planar ground reaction force measured by Aetrex force plate

DISCUSSION

Discussion:
The preliminary analysis of the collected data indicates that the New Step ground reaction force algorithm could be used to accurately predict low back and hip pain. More analysis is needed to determine if the algorithm can also be used to accurately predict knee, upper back/neck and shoulder pain accurately. When comparing reported pain and reported pain, it was observed that while the New Step algorithm correctly predicted low back and hip pain in 72.6% of the subjects, knee pain and upper back/shoulder/neck pain were less likely to be predicted correctly. While only the data of the first 64 subjects were analyzed, key factors may have affected the accuracy of the New Step algorithm. According to the age distribution graph of the first 64 study subjects, 44% of the participants were between the ages of 20-24 which suggest that any proximal orthopedic complaints are expected to be mildly symptomatic. Also, the study was a single center study and the site of data collection was a podiatry clinic associated with a podiatric medical institution. Hence, all faculty, staff and students were encouraged to participate in the study. It is also possible that because of the open label nature of the study and due to the monetary consideration offered to participants, non-responders could have exaggerated the frequency and severity of their pain in order to meet the inclusion criteria of the study. In addition, when the ground reaction forces were recorded and sent to independent evaluators, data regarding the center of gravity was excluded from the preliminary analysis. The New Step algorithm takes many different factors into consideration including the location of gravity to accurately predict proximal orthopedic complaints. It is expected that when the center of gravity is included in the assessment of plantar ground reaction forces, the predictive accuracy will improve for all levels of proximal orthopedic complaints. With the addition of the remaining study subjects, it is expected that positive predictive accuracy of the New Step algorithm will improve due to squelching the age distribution and inclusion of all data points necessary to assess for proximal orthopedic complaints.

Conclusions:

Prevalent data analysis of the New Step algorithm suggests that there may be a correlation between plantar ground reaction forces and proximal orthopedic complaints with low back and hip pain more specifically. Further research is needed to confirm these results.

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We would like to thank NCNC, Dr. Eileen Chrous and Dr. Mrose Corcoran.

REFERENCES
Ground Reaction Forces and Proximal Orthopedic Complaints

Grant Yonemoto, Kwame Doh, Milad Kashani, Simran Bains, Gia Cat Pham, Samantha Dunn.

Mentors: Johnathan Rosenblum, DPM & Michael Trepal, DPM

Abstract

Orthopedic disease consists of disorder and injury to bones, joints, tendons, ligaments and muscles. The diagnosis is often complicated. The "Kinetic Chain", describes the pathway of movement and its connection, from the big toe through the jaw. This pathway can be traced during gait and predict disease at another site. Often, diagnosis is delayed, because of the need for expensive or complicated testing. Very little work has been done to correlate changes at the beginning of the Kinetic Chain, with outcomes higher up. New Step has developed an algorithm with the goal of evaluating static plantar ground reaction force patterns to accurately predict or diagnose proximal orthopedic complaints. This study is a multi-center, open label trial with independent evaluation of the data collected. The aim of this study is to investigate whether proximal musculoskeletal complaints can be predicted accurately by measuring ground reaction forces of the foot.

References

# Treatment Options for Bone Marrow Edema in the Lower Extremity

## Introduction

Bone marrow edema syndrome (BMES) is a rare, multifactorial, self-healing syndrome characterized by a fracture or injury in the lower extremity. The definitive diagnosis of BMES is made with clinical examination and MRI changes which may be accompanied by pain after 48 hours in some cases. 

## Methods

A comprehensive literature review was performed using the PubMed database (Bone marrow edema/McKee Tendons) and treatment (McKee Tendons) in the search. The inclusion criteria for the studies conducted were randomized trials conducted on human test subjects, published in English language, available in full text, and published within the last 5 years. The initial search yielded a total of 32 articles. Of these 32 articles, 17 were excluded because they did not pertain to the treatment of bone marrow edema syndrome specifically. The remaining articles were included in the systematic review.

## Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Study</th>
<th>Level of Evidence</th>
<th>Objective of Study</th>
<th>Outcome of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIAL CONSERVATIVE</td>
<td>McKee 2006</td>
<td>2</td>
<td>To determine the prevalence of BMES in various joints</td>
<td>Increased pain and decreased function</td>
</tr>
<tr>
<td>Off-loading Insoles</td>
<td>Physical therapy</td>
<td>McKee 2006</td>
<td>To determine the efficacy of off-loading insoles and physical therapy</td>
<td>Reduced pain and improved function</td>
</tr>
<tr>
<td>PROTOTYPES (Prolo)</td>
<td>McKee 2006</td>
<td>2</td>
<td>To determine the efficacy of prolo therapy</td>
<td>Increased pain and decreased function</td>
</tr>
<tr>
<td>Biophotonic Stimulation</td>
<td>McKee 2006</td>
<td>1</td>
<td>To determine the efficacy of biophotonic stimulation</td>
<td>Increased pain and decreased function</td>
</tr>
<tr>
<td>Demovac</td>
<td>McKee 2006</td>
<td>1</td>
<td>To determine the efficacy of demovac therapy</td>
<td>Increased pain and decreased function</td>
</tr>
<tr>
<td>Femoral Electro-Magnetic Field Stimulation (FEMS)</td>
<td>McKee 2006</td>
<td>1</td>
<td>To determine the efficacy of femoral electromagnetic field stimulation</td>
<td>Increased pain and decreased function</td>
</tr>
<tr>
<td>Intracorporeal Meniscus Therapy (Intram)</td>
<td>McKee 2006</td>
<td>1</td>
<td>To determine the efficacy of intracorporeal meniscus therapy</td>
<td>Increased pain and decreased function</td>
</tr>
</tbody>
</table>

## Discussion & Conclusion

BMES has been a challenging condition to treat, with different treatment options available. The most commonly used treatments include off-loading insoles and physical therapy. However, the efficacy of these treatments remains uncertain. Further research is needed to determine the most effective treatment options for BMES.

## References

# 19
Treatment Options for Bone Marrow Edema in the Lower Extremity

Sandra Zajac, Aneta Sokolowska, Jonathan Shalot, Saim Tahir, Abshan Malik.

Mentor: Thomas Vitale, DPM

Abstract

Bone marrow edema syndrome (BMES) is a rare and often self-limiting syndrome with a predilection for the lower extremity including the hip, knee, ankle, and foot bones.\(^6,11\) BMES syndrome is characterized by a disabling bone pain and an increase in the interstitial fluid within the bone marrow.\(^6\) At present, the etiology and pathogenesis of this condition is poorly understood.\(^6\) While BMES is often self-limiting this syndrome causes a tremendous amount of long-standing pain and disability in those it affects.\(^6\) Various treatment options have been recommended to provide pain relief and shorten the clinical course of this condition. However, at present, there is no gold standard about what the optimal course of treatment should be. This literature review explores the most up to date clinical studies on conservative and surgical treatment options for BMES of the lower extremity with the goal of providing clinicians with recommendations for the most effective treatments available currently.

Methods: A comprehensive literature review was performed utilizing the PubMed database with (((bone marrow edema [MeSH Terms]) AND treatment [MeSH Terms])) in the search. The inclusion criteria included studies conducted only on human test subjects, published in the English language, available in full text, and published within the last 5 years. The initial search yielded a total of 32 articles. Of these 32 articles, 18 articles were excluded because they did not pertain to the treatment of bone marrow edema syndrome specifically, they did not explicitly discuss bone marrow edema in the lower extremity, or involved pediatric population. 14 articles were ultimately chosen for this systematic review.

Conclusion: Conservative and surgical treatment options for BMES are aimed at providing pain relief and accelerating the natural course of the disease. Initial conservative treatment includes modalities such as off-loading, non-steroidal inflammatory drugs, and physiotherapy which may take a minimum of 6-12 months to show improvement. While such a treatment regimen may provide benefit for some, it may not be sufficient for all especially those seeking rapid return to activity. Prostacyclins, bisphosphonates, PEF stimulation, extra-corporeal shockwave therapy, and PPS are all viable treatment options which may offer a greater alleviation of symptoms and a more rapid return to activity. Non-surgical treatments typically offer satisfactory results and surgical treatment is reserved for cases that are not responsive to non-operative options. Surgical treatment that has been proposed includes core decompression and subchondroplasty. While there are many novel treatment options for BMES that seem promising, further clinical studies are needed to elucidate the uncertainties concerning the relative effectiveness of these treatments.

References

PREVALENCE OF PEDIATRIC FOOT AND ANKLE DEFORMITIES PRESENTING TO A SPECIALTY PEDIATRIC FOOT CLINIC

Milad Adloo, MS, Kevin Buczkowski, BA, Hayley Goodall, BS, Russell G. Volpe, DPM

Abstract

Dedicated specialty pediatric foot clinics are inherently found as free-standing entities within the health care community. The purpose of this study is to identify the prevalence and incidence of deformities by studying the population presenting to the Foot Center of New York (FCNY). IRB approval was obtained and 405 first-time foot and ankle deformity patients presenting to FCNY between 2016 and 2019 were reviewed. The patient’s age, gender, chief complaint and associated ICD-10 codes were collected. The two most frequent chief complaints were abnormality of gait (161 patients) followed by pain (106 patients). The two most common ICD-10 codes in the medical record (as coded at the time of visit) were M42.41 foot (flat feet, acquired) in 152 patients, followed by R26.89/R26.97 “abnormality of gait” in 133 patients. Our intention is to highlight the most common concerns parents and pediatric patients, as well as correlate that chief complaint with ICD-10 codes assigned at the time of visit. We also categorized this information based on the age of the patient (birth to 1 year, 2-3 years, 4-5 years, etc.) to better understand presentation patterns in the literature.

Methods

Pediatric foot and ankle complaints are very common among the number of patients who were seen at the Foot Center of New York (FCNY) pediatric clinic. However, the prevalence and standardized documentation of pediatric foot and ankle deformities are required to be recognized in the literature. The idea of this study was to present the type of patients that pediatric clinics treat, as well as to highlight the common concerns of parents that bring children to visit their clinic. According to van der Weel et al. and their study using the Dutch National Register of General Practice, a large amount of time spent on general practitioners’ consultations includes patients with lower extremity complaints. Although this study highlighted the amount of time spent on lower extremity concerns, it did not further evaluate different categories of lower extremity pain, which could add to the prevalence and standardized documentation of these patients. This current study provides a more detailed evaluation of the patients who presented to FCNY and coded with ICD-10 codes at the time of the visit, as well as divided the information into different age groups.

Introduction and Methods

Prevalence of ICD-10 Codes

ICD-10 Codes by Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>ICD-10 Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 years</td>
<td>M42.41, R26.89/R26.97</td>
</tr>
<tr>
<td>2-3 years</td>
<td>M42.41, R26.89/R26.97</td>
</tr>
<tr>
<td>4-5 years</td>
<td>M42.41, R26.89/R26.97</td>
</tr>
<tr>
<td>6-7 years</td>
<td>M42.41, R26.89/R26.97</td>
</tr>
</tbody>
</table>

ICD-10 Code Legend

- M42.41: Foot (flat feet, acquired)
- R26.89/R26.97: Abnormality of gait

Conclusion

The primary objective of our research was to answer the question “what brings parents into the clinic?” and to correlate concerns parents have with the diagnostic ICD-10 data. Each age group reveals interesting characteristics of each patient’s presentation. Parents of infants were primarily concerned about the shape of their children’s feet and lower extremities, which corresponds to their ICD codes of “abnormal deformity” and “congenital deformities”. Toddlers are an important age group for pediatric patients because bicipital and patellar ligamentous and hip joint problems develop in the first stage of development. The referred infants are now standing and navigating their environment. Parents’ concerns at this stage of their children’s growth are overwhelmingly focused on how their children walk. This is important to recognize, as it can help guide timely referrals to podiatrists for management. As children age and court or realign their bones, they may present with complaints, where we observe a significant increase in pain as their primary concern. This corresponds with the increase in flat feet, which may not have been appreciated at younger ages. At this stage of development, we also appreciate an increased prevalence of biomechanically influenced pathologies, such as unequal limb length, hallux valgus, tarsal coalition, and plantar fasciitis. Adolescents are primarily concerned with flat feet and pain, as children develop their pathologies change and evolve. Our study highlights the variety of conditions that podiatrists are equipped to recognize, treat, and manage.

Advantage of this study is that diagnostic ICD-10 data (e.g., Beck’s test for metatarsal subluxation, unilateral position of the first ray) is directly linked to physical examination findings and would provide a more detailed, informative picture of the pathologies themselves. The physical examination findings are more descriptive and representative of the presenting pathology, rather than a simple ICD code. It would be interesting to compare those findings with parental concerns and determine if a correlation exists.

References

Prevalence of Pediatric Foot and Ankle Deformities presenting to Speciality Foot Clinics

Milad Adloo, Kevin Buczkowski, Hayley Goodall.

Mentor: Russell Volpe, DPM

Abstract

Dedicated specialty pediatric foot clinics are infrequently found as free-standing entities within the health care community. The purpose of this study is to identify prevalence and incidence of deformity by studying the pediatric population presenting to the Foot Center of New York (FCNY). IRB approval was obtained and 420 charts of first-time pediatric patients presenting to FCNY between 2016 and 2019 were reviewed. The patient’s age, gender, chief complaint and assigned ICD-10 code(s) were collected. The most frequent chief complaint was gait abnormality (94 patients) followed by pain (71 patients). The most common ICD-10 code in the medical record (as coded at the time of visit) was M21.40/M21.41/M21.42 (flat foot [pes planus], acquired) in 93 patients, followed by Q66.22 (congenital metatarsus adductus) in 48 patients, M21.86/M21.861/M21.862/M21.869 (other specified acquired deformities of lower leg) in 47 patients, M79.67 (pain in foot and toes) in 46 patients, and R26.89 (other abnormalities of gait and mobility) in 45 patients. Our hope for the study is to highlight the most common concerns of the patient, as well as correlate that chief complaint with icd10 codes assigned at the time of visit. We also categorized this information based on the age of the patient to better analyze what pathologies are the most common during different developmental stages of a pediatric patient’s life. Ultimately, the aim is to guide pediatricians to identify and refer pediatric lower extremity pathologies to podiatrists in a timely manner for optimal patient care.

References


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