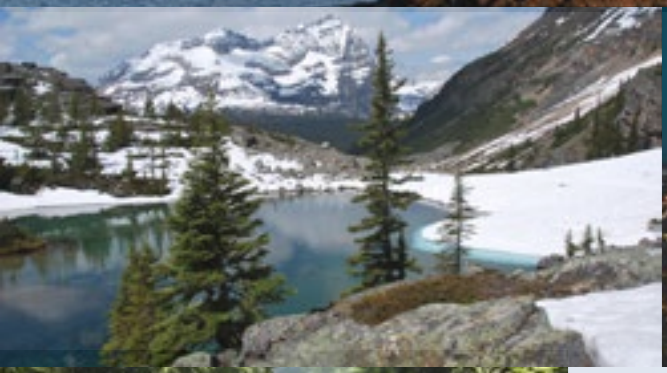
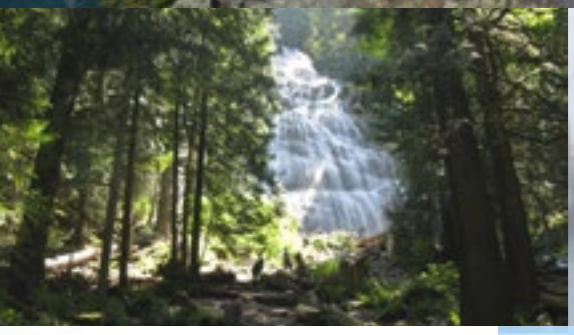
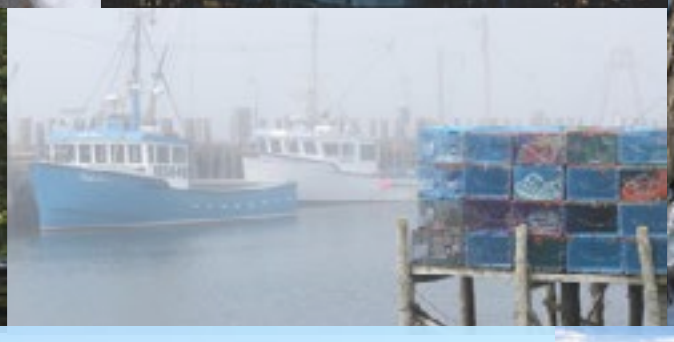
Canadian Society of Hand Therapists

2021 "Virtual" Conference






Saturday June 12, 2021

The Challenge of Upper Extremity Trauma

CSHT PRESIDENT'S MESSAGE

The Canadian Society of Hand Therapists welcomes you to our first virtual conference beginning June 12, 2021. The conference theme this year is ***The Challenge of Upper Extremity Trauma***. an exciting, enlightening program which will highlight practical solutions for complex clinical issues in hand rehabilitation. Incorporating live synchronous sessions on June 12th with 6-month access to on-demand, asynchronous, instructional sessions, you will have ample opportunity to learn and review content remotely. Live sessions will be recorded and made available through the conference platform on June 13, 2021.

Each registrant will be provided with a unique login and the ability to create their own personal profile. We even have a photo booth! In addition, our platform provides question and answer functionality, video demonstrations and gamification for registrants. We are excited to offer you this exceptional continuing professional development opportunity and hope this virtual conference will reach many of our CSHT members across the country and colleagues around the world.

We are privileged to welcome our keynote speakers, Dr. Joy MacDermid and Ms. Gwen van Strien. Dr. Joy MacDermid is a physical therapist, hand therapist, and clinical epidemiologist. She is the Co-director of the Hand and Upper Limb Centre (HULC) Clinical Research Lab and Associate Professor (School of Rehabilitation Science) at McMaster University. In addition, Dr. MacDermid is the Editor in Chief of the *Journal of Hand Therapy*. Her teaching and research emphasize evidence-based practice, assessment and management of musculoskeletal disorders and related work disability, clinical measurement, and knowledge translation. Ms. Gwen van Strien is a physical therapist and hand therapist from The Hague in the Netherlands. Currently she holds the positions of Lecturer in the Department of Rehabilitation at Erasmus University Rotterdam and Course Director and Instructor in Post Graduate Allied Health Education at the National Institute for Allied Health in Amersfoort, the Netherlands. She has authored numerous articles in hand rehabilitation and chapters in *Rehabilitation of the Hand*. She has served as a corresponding editor for the *Journal of Hand Therapy*.

There is a strong Canadian presence of invited speakers delivering on demand recorded presentations. Our speakers are delivering updates on many areas of clinical practice in hand rehabilitation to assist you in meeting the challenges of upper extremity trauma in your day-to-day practice. In addition, we have 25 scientific and clinical presentations. These include systematic reviews, scoping reviews, original research, case studies, descriptions of new or newly adapted orthoses designs and other treatment strategies, and descriptions of clinical treatment programs.

CSHT is a small non-profit association and our annual conference is our premier event. From its humble beginnings 30 years ago, our Society has thrived on the dedication and hard work of volunteers committed to the advancement of hand therapy in Canada. Bringing this conference program to life through these challenging times has required many hours of thoughtful planning and unwavering commitment from our Conference Committee. I wish to express my sincere gratitude to our Program Chair Barb Shankland, Scientific Chair Karen Landry, Exhibitor Coordinator and CSHT Vice-president Susan Hannah, CSHT Secretary Maureen Riley and CSHT Treasurer Lonita Mak.

I also wish to thank Redstone who have assisted us with the logistical and technical aspects of mounting a virtual conference. We are grateful for their guidance and patience as we move into the world of internet based continuing professional development.

On behalf of the CSHT Executive, I would like to thank all the exhibitors for participating in our conference. As our partners in patient care, they offer a wide variety of products and services to assist you in achieving the best outcomes for your patients. Please take a moment to visit their virtual booths in the Exhibit Hall. Don't forget to collect your points for entry in our draw being held June 19th at the CSHT Annual General Meeting. The Grand Prize is a complementary registration for the CSHT 2022 Conference. Winners will be notified by email and their names posted on the conference platform following the draw.

Our virtual conference provides us with the opportunity to network with colleagues from across Canada and around the world. I encourage you to share your clinical experiences, challenge your current practices and engage in a lively dialogue through our virtual platform.

Enjoy the conference! See you online!

Marie Eason Klatt
OT Reg. (Ont.), CHT, MScCH
President CSHT

CSHT EXECUTIVE

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CONFERENCE COMMITTEE

Barbara Shankland
Program Chair

Karen Landry
Scientific Chair

CSHT 2021 VIRTUAL CONFERENCE LEARNING OBJECTIVES

The CSHT 2021 "Virtual" conference content will provide participants with the opportunity to achieve the following learning objectives:

1) Understand current, evidence-based surgical and rehabilitation approaches for upper extremity trauma.
2) Develop practical skills in upper extremity orthotic fabrication.
3) Increase knowledge regarding recent research findings in the area of upper extremity rehabilitation.

Individual presentations may also include specific learning objectives related to their topic.

Live sessions being held June 12, 2021 at 1:00 p.m. Eastern Standard Time will be recorded and made available through the conference platform on June 13th.

Recordings of the Live Sessions, all On Demand sessions and Scientific sessions will be available until Monday December 20, 2021 at 1:00 p.m. Eastern Standard time.

Conference Registrants must download their CEU certificates by Monday December 20, 2021 at 1 p.m. Eastern Standard Time.

LIVE PRESENTATIONS: Saturday, June 12, 2021

CSHT President's Welcome, Announcements & Introduction of the Keynote Speakers	1:00 PM EST
Gwen van Strien, BSc, MSc, PT Part. 1: Rethinking How We Use Flexor Tendon Protocols	1:15 PM EST
15 Minute Break	2:15 PM EST
Gwen van Strien, BSc, MSc, PT Part. 2: Extensor Tendons: Early Active Motion-Choosing the Best Approach Based on Evidence	2:30 PM EST
15 Minute Break	3:30 PM EST
Joy MacDermid, BSc, BScPT, MSc, PhD Patient Rated Outcome Measures Following Upper Extremity Trauma–Predicting Success	3:45 PM EST
Presentation of the CSHT Lifetime Membership Award for 2020	4:45 PM EST
Presentation of the CSHT Lifetime Membership Award for 2021	5:00 PM EST

Join us Live on June 12, 2021 for these sessions beginning at 1 PM Eastern Standard Time.

Live sessions will be recorded and made available through the conference platform on June 13, 2021.

ON DEMAND RECORDED SESSIONS:

BURNS AND WOUND CARE

Management of Upper Extremity Burns — 60 minutes
Joel Fish, MD, FRCSC

Wound Care, Scar Evaluation and Management of Complex Injuries — 60 minutes
Bernadette Nedelec, BScOT, PhD, OT(C), erg.

MUTILATING INJURIES AND REPLANTATION

Upper Extremity Replantation: The Quebec (CEVARMU) Program Experience — 60 minutes
Émilie Valois, BScOT, erg., CHT

Therapeutic Management of Complex Mutilating Injuries of the Upper Extremity — 60 minutes
Shrikant Chinchalkar, MSc, OTR, OT (Reg), CHT

NERVE INJURIES

Surgical Treatment of Adult Brachial Plexus Injuries — 60 minutes
Heather Baltzer, MSc, MD, FRCS

Rehabilitation Following Brachial Plexus Nerve Injury – A Changing Paradigm — 60 minutes
Christine Novak, BSc (kin), BScPT, MSc, PhD, PT

Therapeutic Management Post Nerve Transfers — 90 minutes
Julianna Larocerie, BSc, MSc, OT (Reg), CHT

Somatosensory Evaluation and Treatment — 90 minutes
Tara Packham BScOT, MSc, PhD, OT (Reg)

EXTENSOR TENDONS AND THE PIP JOINT

Anatomy Update of the Extensor Mechanism - Implications for Testing and Treatment of Zone 3 Injuries and Related PIP Problems — 90 minutes
Gwen van Strien, BSc, MSc, PT

ON DEMAND RECORDED SESSIONS:

THE STIFF HAND

Rehabilitation of the Stiff Hand — 90 minutes
Mike Vallely, BScPT, PT

Advanced Orthotic Fabrication for Stiffness — 90 minutes
Debby Schwartz, OTD, OTR/L, CHT;
ORFIT Industries

NEOPRENE-THERMOPLASTIC ORTHOSIS FABRICATION

Custom Neoprene Orthoses; for Function, Comfort and Compliance — 90 minutes
Sue Ellis, BScOT, OT Reg. (Ont.);
Antoinette Krakovsky, BScOT, OT Reg. (Ont.)

OUTCOME MEASURES

Applying Upper Extremity Patient Rated Outcome Measures in Clinical Decision- Making: A Case Based Approach — 90 minutes
Joy MacDermid, BSc, BScPT, MSc, PhD

CASE PRESENTATIONS

Trauma related case presentations — 60 minutes
Minh-Quan Tran, BSc, MScA, erg., CHT; Karen Landry, BScOT, MSc, CHT;
Maureen Riley, BScOT, OT(Reg), CHT

THANK YOU TO OUR EXHIBITORS FOR THEIR GENEROUS SUPPORT:

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EXHIBITORS VIRTUAL BOOTHS OPEN AT NOON ON JUNE 12TH

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SCIENTIFIC SESSION ABSTRACTS

1. Alternative management of mallet finger injuries based on finger biomechanics

Presenting author: Juliana Larocerie Salgado, OT, MSc, CHT

Co- author: Shrikant Chinchalkar, OTR, MThO, CHT

Introduction & Objectives: Mallet finger injuries have been classically treated by immobilization of the distal interphalangeal (DIP) joint in extension or slightly hyperextended for 6-8 weeks. Despite of the prolonged treatment, a 10 to 15 degrees of extension lag is considered acceptable. Nevertheless, even such a small degree of extension lag may create enough biomechanical imbalance to the intricate extension apparatus of the finger, potentially leading to fixed deformities, such as swan-neck. The purpose of this case series is to present an alternative rehabilitation option for the treatment of mallet finger injuries, taking into consideration biomechanics of the extensor tendon mechanism, in the hopes of optimizing DIP joint extension and prevent finger deformities.

Methods: Patients with acute mallet finger injuries were considered for this case series. Patients were provided with a finger-based thermoplastic cast orthosis for 4 weeks, and then a finger-based orthoses for 4 more weeks, including the proximal interphalangeal (PIP) joint at approximately 30° of flexion and the DIPJ in neutral or slightly hyperextended. Measurements of DIP joint extension were taken with a finger goniometer at approximately 12 weeks.

Results: To date, a total of 20 patients with mallet finger injuries were treated in the Hand Therapy Dept of our centre. Patients age range from 14 to 86 years old, and there were 7 females and 13 males. In average, patients were seen in Hand Therapy for 12 weeks. The total time of complete immobilization was in average 8 weeks. At the time of the last follow-up visit, patients demonstrated an average 3.0 ° of DIP joint flexion extension. PIP joint flexion and extension was the same as pre-injury.

Conclusions: Treating mallet finger injuries with an orthosis that include both the PIP and DIP joints seems to be more effective in treating these injuries and preventing future deformities than treating the DIP joint alone. Additionally, using a non-removable circumferential orthosis (cast) in the first 4 weeks of treatment seems to decrease complication rates associated with skin irritation and inability to maintain optimal position when donning/doffing thermoplastic orthosis.

Keywords: mallet injuries, mallet finger, swan-neck deformities

2. Management of long-term upper-limb complex regional pain syndrome presenting allodynia: a case report

Presenting Author: Isabelle Quintal, BSc erg, MSc, PhD(c)

Co-Authors: Laurent Poiré-Hamel, MSc erg; Daniel Bourbonnais, erg, PhD; Joseph-Omer Dyer, pht, PhD

Background: Complex Regional Pain Syndrome (CRPS) is characterized by sensory, motor, sudomotor, vasomotor edema and/or trophic signs. Painful sensations (e.g., allodynia) and skin sensibility disorders (e.g., numbness) are often a cause of complaints and decreased function in CRPS. This case report describes a successful innovative tailored rehabilitation program applied with a patient having upper-limb CRPS with static mechanical allodynia (SMA) for 16 months, who initially did not respond to conventional rehabilitation alone (desensitization techniques, active exercises). On the first visit, the person presented a severe allodynia of the entire affected upper limb limiting any movement and hampering his functional independence.

Method: The tailored rehabilitation program initially consisted of occupational therapy including the somatosensory rehabilitation method (SRM) and graded motor imagery (GMI). Conventional treatments (pain management and education, active exercises, strengthening and task simulation) were then added successively.

Results: Over a period of 22 months of treatment, this patient showed: decreased pain (Numeric pain scale; McGill pain questionnaire), resolution of SMA, decrease tactile hypoaesthesia, increased range of motion and strength, and improved functional independence (DASH; interviews).

Conclusion: A tailored and multimodal rehabilitation program including SRM seems promising for treating patients with upper-limb CRPS with SMA. Further studies are needed to explore how different modalities such as SRM and GMI should be combined to optimize their beneficial effects and to identify which patients would benefit the most.

3. Characterization of tactile stimulation programs for treating hand allodynia: a systematic review

Presenting Author: Isabelle Quintal, BSc erg, MSc, PhD(c)

Co-Authors: Tara Packham, erg, PhD, CHT; Daniel Bourbonnais, erg, PhD; Alexis Carrier, MSc erg; Joseph-Omer Dyer, pht, PhD

Background: Peripheral nerve injuries are among the top ten diagnoses seen in hand therapy. Those injuries can lead to a decrease of cutaneous sensibility (e.g., numbness) and/or to neuropathic pain. Neuropathic pain can include dysesthesia which is an unpleasant abnormal sensation whether spontaneous (e.g. neuralgia) or evoked (e.g. allodynia). Touch-evoked dysesthesia (i.e., mechanical allodynia) in the hand can impact function, independence in daily living activities and quality of life. Tactile stimulation programs are widely used to treat hand allodynia in hand therapy settings.

Objective: To document effects of tactile stimulation programs for treating pain in persons with hand mechanical allodynia following a peripheral nerve injury

Method: The systematic review was conducted following PRISMA guidelines up to January 1st 2020 on the following databases: Medline, Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and the Cochrane Library. Inclusion criteria included: 1) tactile stimulation program; 2) adults presenting allodynia at the hand; 3) pain as an outcome. Exclusion criteria were: 1) cold/heat dysesthesia (only); 2) polyneuropathy or phantom limb pain as a primary diagnosis; 3) dysesthesia secondary to chemotherapy; 4) studies on healthy subjects, newborns or animals. Study quality was assessed using the Methodological Index for Non-Randomized Studies (MINORS). Risks of bias were assessed according to Cochrane handbook for systematic reviews for interventions.

Results: Eleven studies were identified according to the eligibility criteria. Studies were either addressing desensitization techniques (n=7) or somatosensory rehabilitation (n=4). Populations with hand mechanical allodynia included CRPS type I and II, hand and upper limb injuries, burned survivors and painful hand and moving fingers. Outcomes addressed qualitative description of pain, pain intensity, allodynic surface and allodynic severity. Statistical differences for decrease of pain were found in three studies addressing desensitization and in two studies addressing somatosensory rehabilitation. All studies showed limits in terms of quality of the study itself and showed risks of bias.

Discussion: Heterogeneity of samples within the studies themselves and between studies included making difficult to compare the different results. Desensitization studies described a wide range of intervention modalities, while somatosensory rehabilitation studies intervention parameters were standardized across the different studies. Overall, interventions, including desensitization and SRM, were predominantly used as a home program for a few times a day (1-8 times) and for a few minutes (1-10 minutes) each time. Most of the studies suggested not to increase the level of pain and recommended that the stimulation be tolerable.

Conclusion: The studies reviewed suggest that tactile stimulation programs can decrease hand mechanical allodynia. Nevertheless, this review suggests inconclusive evidence and inconsistent implementation of those tactile stimulation programs.

4.Diagnostic Accuracy of Scales, Questionnaires and Hand Symptom Diagrams for the Diagnosis of Carpal Tunnel Syndrome: A Systematic Review of Diagnostic Test Accuracy

Presenting Author: Armaghan Dabbagh, PT PhD (Candidate)

Co-Authors: Joy C MacDermid, PT PhD; Joshua Yong, B(OT), MSc; Luciana G. Macedo, PT PhD; Tara L. Packham, OT PhD

Background: Carpal Tunnel Syndrome CTS is the most prevalent compressive neuropathy of the upper extremity. Good clinical tests can support accurate diagnosis and management of CTS.

Objective: To summarize and evaluate research on the accuracy of clinical diagnostic scales, questionnaires and hand symptom diagrams/maps (HSD) used for diagnosis of CTS.

Methods: A comprehensive literature search of MEDLINE, CINAHL, and Embase databases, using keywords related to the diagnostic accuracy of CTS, was conducted on August 2, 2018. PRISMA guidelines were followed. Quality assessment of bias and applicability was conducted using the QUADAS-2 tool. Diagnostic accuracy properties were summarized.

Results: Out of 5552 citations, 21 articles met the inclusion criteria. Twelve articles reported on the diagnostic accuracy of scales and questionnaires: Bland questionnaire, Kamath and Stothard questionnaire, CTS-6, Boston carpal tunnel questionnaire, Wainner clinical prediction rule, Lo carpal tunnel prediction rule. Positive likelihood ratios (LRs) ranged from 0.94 for Boston carpal tunnel questionnaire to 10.5 for CTS-6 scale, and negative LRs ranged from 1.05 to 0.05 for the same diagnostic tools. Nine studies were identified on the diagnostic accuracy of Katz and Stirrat HSD. Positive and negative LRs ranged from 1.42 to 8, and from 0.78 to 0.05, respectively. Only four studies had high methodologic quality.

Conclusion: Limited evidence supports high accuracy of CTS-6, Kamath and Stothard questionnaire, and Katz and Stirrat's HSD. Other scales have lesser and more conflicting evidence. Further high-quality studies are necessary to examine the diagnostic accuracy of these tests to assist ruling in or out for CTS.

5. Reliability, validity and responsiveness of functional range of motion measures of the fingers: a clinical measurement study

Presenting author: Rafael Paolo Lansang, BHSc

Co-authors: Pam Ball, OT Reg. (Ont.); Lisa Galant, OT Reg. (Ont.); Vivian Dim, OT Reg. (Ont.); Tara Packham, PhD, OT Reg. (Ont.)

Background: The measurement of range of motion (ROM) is a foundational skill in the field of hand therapy, as measures of ROM are considered to be useful indicators of movement capability and hand function. Two of the most commonly reported measurements of ROM are Total Active Movement (TAM) and Total Passive Movement (TPM). TAM/TPM sum the degrees of flexion at all joints of a hand forming a fist, then subtract the extension deficits at each joint to produce a final score for each digit. Functional Range of Motion (FROM), also known as "pulp to palm" or composite finger flexion, is proposed to be an alternative outcome measure that is more convenient. FROM measures the distance between 2 anatomical reference points: from the finger pulp to the distal palmar crease of a patient flexing their digit. FROM may be a more patient-important outcome than TAM or TPM as it provides easily comprehensible feedback regarding a common functional movement pattern. However, FROM is used less frequently in research reporting ROM than TAM/TPM, perhaps as there is only one measurement paper reporting reliability and validity.

Purpose: This study aims to compare FROM to standard goniometric measurements to determine a) whether FROM is a reliable, valid and responsive measure of hand motion, and b) if FROM is of higher utility to the tester.

Methods: We are conducting a cross-sectional measurement study recruiting persons attending hand rehabilitation who have no medical restrictions for completion of ROM, strength or edema measures. At baseline, each participant completes the Patient-Rated Wrist and Hand Evaluation (PRWHE) and self-reports stiffness on a scale of 0-10. FROM is then measured using standardized procedures by 2 evaluators blinded to each other's results, with one evaluator measuring twice. Following usual hand therapy interventions, the FROM measures are repeated by a single evaluator, who also measures TAM and TPM, noting the time taken to complete each. Grip strength is measured using a dynamometer, and any edema documented using water displacement and circumferential approaches. The participant also re-rates stiffness post-treatment to estimate if there is any intra-session change.

Results: To date, we have recruited 31 of our target sample of 50. We will estimate inter-rater and test-retest reliability using intraclass correlation coefficients. We will estimate criterion validity for TAM and TPM measures, convergent validity for grip measures, predictive validity for decreased stiffness pre/post treatment, and divergent validity for PRWHE and edema scores. We will also examine the effect of edema on ROM through regression modelling to understand the relative influence of edema on the different measurement approaches. Finally, we will estimate the effect size of a single treatment session to consider responsiveness.

Discussion/Conclusion: The results of this study can inform use of FROM measures in clinical practice and research by adding to our understanding of the reliability, validity, utility and responsiveness of this method.

6. Questioning how we describe our practice: the development of standardized demographic questions for surveys of hand therapists using cognitive debriefing

Presenting author: Tara Packham, PhD, OT Reg. (Ont.)

Co-authors: Rafael Paolo Lansang, BHSc; Brocha Stern, PhD, OTR, CHT; Pam Ball, OT Reg (Ont.); Lisa Galant OT Reg (Ont.)

Background: Hand therapy practice surveys frequently draw on members of the American and Canadian Society of Hand Therapists (ASHT & CSHT, respectively). However, because of differences in the demographic questions used to conduct such surveys, it is difficult to compare the results across studies and monitor changes in practice over time.

Objective: To develop and pilot test a core set of demographic questions for hand therapy survey research, evaluating questions and response options.

Methods: Working with the Research Division of ASHT, we developed and pilot tested a proposed core set of demographic questions, mapping potential questions and key constructs from previously published surveys. Cognitive debriefing interviews were then conducted with key informants from diverse backgrounds and practice areas selected by the researchers or nominated by colleagues in the research division. The debriefing process asked interviewees to answer the questions aloud, and discuss why they chose the answer they did. They identified questions that were not clear, or where the answer options were not reflective of their current status or experience, and whether they felt the information was 'core' or peripheral. Issues were categorized using a system proposed by MacDermid for the interpretation of cognitive interview findings, and solutions proposed and implemented.

Results: Cognitive debriefing interviews (n=7 to date) are reviewing 16 core and 14 peripheral standardized questions, identifying problems with clarity and comprehensiveness of response options.

Discussion/Conclusion: These standardized core and peripheral questions should support hand therapy survey research and assist in tracking the evolution of rehabilitation practices over time.

7. Phantom breast syndrome: preliminary results of an international survey

Presenting author: Tara Packham, PhD, OT Reg. (Ont.)

Co-authors: Siobhan Graham, MScOT student, University of Toronto

Background: Phantom breast pain (PBP) is a phenomenon characterized by painful sensations perceived to occur in the breast after a mastectomy. While it is thought to occur far less often than post-mastectomy pain, the predictors of which subgroups are at risk, and potential morbidity has been poorly studied. As a result, no treatments are documented in the literature.

Objective: To increase understanding of the symptoms and experience of persons with PBP, including pain, and understand the relationships to upper limb function and residual scarring.

Methods: To better capture the PBP incidence, and understand differences from post-mastectomy pain, we developed a survey for anyone with post-mastectomy pain. However, we included specific questions on PBP based on a scoping review of the literature. We also embedded validated self-report questions addressing overall health, pain qualities, pain catastrophizing, scar qualities, and upper limb function. The survey was pilot-tested with patient and professional stakeholders, and is now being distributed via social media channels such as Facebook, LinkedIn, Instagram, and Twitter.

Results: We will present the preliminary results of survey data to date with a focus on pain, scar morbidity, and upper limb function. We will compare the prevalence and severity of symptoms between persons with post-mastectomy pain and those who have experienced PBP. We will also describe the health services used by our participants, and identify unmet needs.

Discussion/Conclusion: The results of this survey can inform our understanding of PBP and assist in developing treatment programs to address the unmet needs of persons after mastectomy.

8. Evaluating the Michigan Hand Questionnaire using Rasch analysis

Presenting author: Tara Packham, PhD, OT Reg. (Ont.)

Co-authors: Robert Wouters, PT, PhD; Joy MacDermid, PT, PhD

Background: The Michigan Hand Questionnaire (MHQ) is a widely used self-reported measure of hand function. Developed in 1988, it evaluates both unilateral and bilateral hand functions. The MHQ has 6 subscales, addressing overall hand function, activities of daily living, work, pain, aesthetics and satisfaction.

Rasch analysis is a form of psychometric evaluation that evaluates items and scales, and offers strategies to improve the precision of measurement by a) converting ordinal scaling to interval-level measures for statistical calculations, b) identifying systematic biases between respondent groups (e.g. if men and women with similar hand problems answer differently) and c) validating subscale structures, and identifying items that appear to measure something other than the targeted construct. To date, the MHQ has not been evaluated using Rasch analysis.

Objective: To evaluate the structural validity and scaling properties of the MHQ using Rasch analysis.

Methods: This is a secondary data analysis from a large database of persons with thumb carpometacarpal arthritis in the Netherlands (n=924). Hand function as measured by the MHQ was triangulated with other person factors including age, sex, type of work, if the dominant hand was affected, whether they went on to have surgery, and pain catastrophizing. An iterative analysis following recommended procedures was conducted using RUMM2030 software to evaluate the fit of persons and items to the Rasch model, check for systematic bias, and verify the scoring and scaling structures of the tool. While the duplication of some questions to address bilateral hand function yields a total of 57 items on the MHQ, the constraints of the software only permitted analysis of the 37 items representing all bilateral items and the unilateral items for the hand identified as most affected.

Results: Item rescoring was required for 11 of the 37 items, reducing 7 items to a 4-point scale, and 4 items to a 3-point scale structure: most problematic items were from the work and aesthetics scales. Only 2 of the subscales (impairments and pain) demonstrated fit to the Rasch model, suggesting other scales contained extraneous items. When we further split the daily activities scale into unilateral and bilateral activities, unilateral activities did fit the model. Analysis for scoring bias using differential item function identified multiple instances of bias based on respondent sex, and others from surgical status, work status, and pain catastrophizing. Good reliability coefficients were found for all subscales except aesthetics, where 50% of the score variability seen was from random error.

Discussion/Conclusion: Our results suggest the MHQ measures more than hand function. Only 2 subscales (Impairments and Pain) demonstrated sufficiently robust measurement properties to support use in statistical calculations without introducing substantive measurement error. These findings are concordant with other studies using factor analysis that have questioned the scaling structure of the MHQ. The aesthetics scale was particularly susceptible to random variation, and may not yield consistent evaluation. While clinicians may continue to find the MHQ helpful to estimate hand function in individual patients, caution is merited for use and interpretation of MHQ scores as a clinical trial outcome.

9. Enabling Function with Humeral Fracture Bracing

Presenting Author: Paula Rico, OT Reg. (Ont.)

Co-Authors: Antoinette Krakovsky OT Reg. (Ont.); Marie Eason Klatt OT Reg. (Ont.), CHT, MScCH

Although functional bracing for humeral fractures was developed by Augusto Sarmiento in 1967, this conservative treatment is infrequently used. Sarmiento applied basic hydraulic principles to design a fracture brace which allows free movement of adjacent joints while immobilizing the fracture site. This results in reduced recovery time and enables earlier return to daily activities compared to a plaster or fiberglass cast immobilization. The aim of this presentation is to briefly summarize the current literature on the Sarmiento (functional) brace for humeral fractures; outline the indications, contraindications, and treatment protocols; and illustrate the steps involved in custom fabrication using low-temperature thermoplastics. Additionally, the advantages and disadvantages of prefabricated, and custom-made braces will be summarized.

10. Proximal Median Nerve Entrapment: Clinical presentation, examination and treatment

Presenting Author: Lynda O'Callaghan, PT, MA (In Education)

Co-Author: Marie Eason Klatt, OT Reg. (Ont.), CHT, MScCH

Background: Median nerve entrapment is commonly associated with carpal tunnel syndrome; however, there are multiple sites of compression for the median nerve along its pathway.

Objective: To review the less common median nerve compressions proximal to the wrist including clinical presentation, diagnosis and treatment options. Particular attention will be paid to sites of compression around the elbow including proximal median nerve entrapment (PMNE).

Method: Electronic databases PubMed CINAHL (Cumulative Index to Nursing and Allied Health Literature), were searched for abstracts that included the term lacertus syndrome/entrapment. Studies were included if they were published in English.

The yield was extremely low with 14 citations dating from 1977-2018. In addition, reference lists of selected studies were hand searched. Several references were subsequently added since this abstract was first submitted in 2019.

Results: Unlike Carpal tunnel Syndrome; PMNE is often not diagnosed with objective measures such as MRI, EMG or nerve conduction studies but through clinical examination and subjective reports. Common complaints of patients diagnosed with PMNE at the level of the lacertus fibrosus include loss of key and tip pinch strength, loss of fine motor skills, and sense of clumsiness and occasionally paresthesia in the median nerve distribution of the hand. On examination patients present with 3 classic symptoms:
1) Weakness with manual muscle testing in median nerve innervated muscles below the lacertus fibrosus,
2) Patients may have pain and a positive Tinel's sign,
3) A positive scratch collapse test.

Conclusion: Knowledge of the less commonly diagnosed median nerve entrapments and their clinical examination are essential skills for the hand therapist. It is especially helpful for those patients who have lingering symptomatology following carpal tunnel release.

11. Exploring Children's Understanding of their Brachial Plexus Birth Injury

Presenting Author: Kathleen Lai, BHSc, MScOT, OT Reg. (Ont.)

Co-Author: Michelle Goldsand, BSc, MScOT, OT Reg. (Ont.)

Introduction: Participating in healthcare decisions can increase a child's engagement in therapy, promoting better health outcomes. One way to enable children to assume a greater role in the management of their care is by improving their health literacy. Exploring children's understanding of their brachial plexus birth injury can assist clinicians in developing client centered educational protocols to promote health literacy.

Objectives: The primary objective of this study is to explore children's understanding of their brachial plexus birth injury.

Methods: This cross-sectional qualitative study will use a purposive sample of children and adolescents between 6- and 18-years receiving treatment at a brachial plexus clinic in a large urban paediatric hospital. An applied interpretive approach will be used to conduct semi-structured interviews and arts-based data collection to explore children's understanding of their injury. Preliminary thematic analysis of transcribed interviews and participant-created drawings will be presented.

Practice Implications: Occupational therapists frequently take on the role of educator and are well-positioned to lead quality improvement initiatives for educational protocols. The findings of this study may demonstrate a gap in children's understanding of their injury. From the voices of children directly, themes will emerge detailing how their injury is perceived and experienced. These themes can be applied to generate educational protocols that best reflect their needs and fill the gaps in children's knowledge.

Conclusions: This study has the potential to inform best practice guidelines for educating children with birth injuries, improving quality of care.

12. An Innovative Adjustable Hinge Splint Design for Metacarpophalangeal Joint Arthroplasty

Presenting Author: Cindy Holmes BScOT, CHT

Co Authors: Dianna Lau BScOT, CHT; Justine Shih BScOT; Diane Klassen BScOT/PT; Mark Labrentz BScPT, CHT; Christine Guptill BSc, Bmus, MS (OT), PhD, OT

Historically, the initial post-operative splint for Metacarpophalangeal Joint (MCPJ) Arthroplasty is a dynamic extension splint. Despite advances in technology and surgical techniques there has been no innovation in splint design. Difficulties with this splint design include: a high outrigger necessitating inclusion of the wrist for splint stability , passive extension does not allow active gliding of the extensor tendons, pressure is exerted dorsally over the surgical site, rotation of fingers, pressure on the radial aspect of the index finger due to radial pull from elastics and potential need for night static extension splint

Clinical Reasoning: The only alternative identified in a literature review was static splinting which would inhibit functional hand use for 4-6 weeks. As a result, our team aimed to develop an innovative splint that would meet the following goals:

1. **Allow early motion to maximize flexion and extension of the MCPJ and prevent ulnar deviation.**
2. **Protect the following structures:**
   - Joint capsule from ulnar forces during the encapsulation process
   - Radial sagittal band through limiting flexion of MCPJ
3. **Economical, durable and easily fabricated**
4. **Adjustable design to allow for day and nighttime use.**

Innovative, Analytical or New Approach: We felt we could accomplish this if we had a small hinge that was adjustable to restrict motion in the desired limits while protecting against ulnar deviation. Traditional hinges are metal, used for the wrist/elbow and expensive. We partnered with a manufacturing company to design a 3D printed hinge in a size suitable for a MCPJ. The adjustable hinge eliminates the need for outriggers, allows for a hand-based design, and eliminates dorsal pressure and rotation forces. The hinges can limit flexion and can maintain full extension of MCPJ's at night. The materials to make the hinge is inexpensive and plastic, which easily attaches to thermoplastics.

Contribution to Hand Therapy practice: Use of a new technology, 3D printing, to fabricate splint designs previously not possible. Potential to change hinges currently used in hand therapy.

Potential for improved outcomes. A research study comparing the dynamic extension splint to our new design is starting participant recruitment.

13. Comfort and Function Remain Key Factors in Upper Limb Prosthetic Abandonment: Findings of a Scoping Review

Presenting Author: Tara L. Packham, PhD, OT Reg. (Ont.)

Co-Authors: Lauren C. Smail, PhD candidate; Chantelle Neal, OT Reg. (Ont.); Courtney Wilkins, OT Reg. (Ont.)

Purpose: Upper limb prosthetic device abandonment rates are dramatically high; however, the reasons behind abandonment are less understood. A scoping review was conducted to explore the current literature on why individuals abandon upper limb prosthetic devices, and consider how these reasons have evolved historically.

Materials and Methods: A systematic search of the literature identified 123 articles addressing abandonment. After reviewing the articles using predetermined inclusion and exclusion criteria, 9 relevant articles covering passive, body-powered and myoelectric prosthetic devices were included in the final review.

Results: Across time, reasons for abandonment could be broadly categorized into comfort and function. Weight, temperature, and perspiration were the most common and persistent comfort-related reasons for abandonment, while concerns about control and sensory feedback were linked to participants feeling more functional without their device.

Conclusions: Across time, lack of comfort and function persist as drivers of upper limb prosthesis abandonment. Up-to-date research on reasons for abandonment of upper limb prosthetic devices is lacking, and recent prosthesis advancements have not been included in studies of device use, adoption and abandonment. Therefore, future work should explore reasons for abandonment in contemporary upper limb prosthetic devices. By understanding the reasons for abandonment, therapists can use this information to inform their rehabilitation practices for upper limb amputation and prosthetic training to proactively mitigate future device abandonment. Findings from this review can guide future prosthetic device development to improve these modifiable areas of concern by targeting user values and needs.

14. The Origins of Low Temperature Thermoplastics – The Unsung Heroes

Presenting Author: Pat McKee, BSc (OT), MSc

Thermoplastics have been mainstay of orthotic fabrication since the 1970s and the origins are fascinating and involve important contributions by occupational therapists. The chemistry behind these early thermoplastics is based on just two polymers and can be traced back to discovers, beginning about 1963, by three pairs of individuals – Lester Larson and Dorothy Kester OTR; Jean Clark OTR and John Clark; and John Kirk and Lloyd Wartman. These discoveries revolutionized orthotic fabrication for therapists and their clients and involve intriguing connections to golf balls, buoys, Phantom of the Opera and Canada. This history has been gathered from interviews with the inventors and in one case, a son who continues to operate a company based on the developments of his father.

15. Alternative conservative management of unstable proximal and middle phalanx fractures: static linear skin traction

Presenting author: Kristen MacDonald, MSc OT, CHT

Co-Authors: Juliana Larocerie, OT, MSc, CHT; Shrikant Chinchalkar, OTR, MThO, CHT

Introduction & Objectives: Extra-articular spiral and oblique fractures of the proximal and middle phalanges are typically unstable. Typical treatment is open reduction and internal fixation. Given the large bone-tendon interface in these areas, decreased range of motion (ROM) associated with tendon adhesions and stiffness are common complications. Therefore, we propose an alternative conservative approach to the management of these fractures by means of static skin linear traction.

Methods: Patients with unstable proximal or middle phalangeal fractures were considered for this case series. Volar hand-based intrinsic plus orthoses were fabricated and linear skin traction was applied to the affected digit using tape and a spring at the tip with 300-400 gr of tension. Once applied, radiographs were taken to confirm reduction. Radiographs were repeated on a weekly basis to evaluate positioning and bony union. Traction was applied for 4-6 weeks, and active ROM initiated once clinical healing observed (~3-4 weeks).

Results: To date, we have treated five patients with proximal or middle phalangeal fractures treated as described above. Patient age ranged from 19 to 49 years old, 4 females and 1 male, 2 proximal, and 3 middle phalangeal fractures. Patients were followed on average for 12 weeks (8-20 weeks), with ROM averaging 0-86.3° at the MCPJ, 0-103.4° at the PIPJ, and -2-64.4° at the DIPJ.

Conclusions: Unstable spiral and oblique extra-articular fractures of the middle and proximal phalanges can be effectively reduced with conservative skin linear traction with fewer complications and restoring ROM.

Keywords: static linear traction, proximal phalanx fracture, middle phalanx fracture

16. A Case Report of Recurrent Annular Ligament Displacement in a Pediatric Patient

Presenting Author: Cameron Van Oort, BSc, MSc, MScOT, CHT

Annular ligament displacement (ALD; pulled elbow, nursemaid's elbow or radial head subluxation) is a common pediatric condition typically resulting from a sudden axial traction of the forearm while the elbow is fully extended. With single incidents, closed reduction is the preferred technique to re-establish proper articulation. However, with recurrent ALD there is a paucity of literature for effective treatment. The current dearth of case study based articles describes two options. The first is conservative management via repeated closed reductions as they occur, which can be concerning to parents each time they have to go to hospital to have their child's elbow reduced. Conversely, surgical management has been performed in a few cases but this can be of greater concern for parents and caregivers.

This presentation describes the successful conservative management of a patient with recurrent ALD, having occurred five times in one year span. A 2 year, 4-month old Caucasian female presented to the clinic along with her concerned parents who reported the patient having five ALD incidents to her left elbow. The first occurred at 1 year, 6 months of age and the fifth incident occurred at 2 years, 2 months of age as the patient was being assisted in putting on her winter jacket. The patient was treated with a Benik Size 3 E-600 Static Velcro Sensitive Elbow Wrap (Benik Corporation© Silverdale, WA) with the elbow limited to -60 degrees of extension. A compression stockinette was also placed over top of the Benik Elbow Wrap to ensure the patient would not be able to remove the brace. It was recommended to have the brace on for all waking hours other than hygiene for three months to allow improved stability of the elbow. In addition, strengthening interventions targeting the common extensor origin and supinator were prescribed to provide dynamic support to the annular ligament. Education was also provided regarding avoiding axial traction on the forearm with the elbow in extension to help prevent recurrence.

This case study demonstrates the potential for preventing ALD recurrences by limiting full extension of the elbow (i.e., the position of the elbow when ALD typically occurs) with a day-time orthosis. Although it is difficult to determine when the annular ligament is taught enough to discontinue bracing, three months was evidently enough to prevent recurrence of ALD in this child. It is postulated that bracing led to tightening of the annular ligament or growth of the radial head to allow for improved stability of the proximal radioulnar joint. Furthermore, strengthening of the common extensor origin and supinator is postulated to have allowed for improved dynamic support of the annular ligament.

17. Evaluating a Wireless Wearable Exoskeleton for Hand Rehabilitation

Presenting Author: Thomas Vaughan: Ph.D.

Co-Authors: Denis Laroche, M.A.Sc.; Mark Hewko, M.Eng.; Zinan He, Ph.D.; Camille Proulx, OT, Ph.D candidate; Johanne Higgins, OT, Ph.D.; Dany H Gagnon, PT, Ph.D.

Introduction: Robotic-assisted rehabilitative therapy may allow tele-rehabilitation treatment comparable to in-clinic rehabilitation [1]. Advances in wearable, non-prosthetic, wireless hand exoskeletons may offer opportunities for independent therapy at home and user engagement through entertaining media [2]. Although appealing, the properties and limitations of exoskeleton technologies must be established prior to clinical studies or exploring additional opportunities in e.g. data science to provide clinical decision support or automated tailored feedback to the patient.

Objective: Evaluate the properties and limitations of a commercial hand exoskeleton prototype (Dexmo, Dexta Robotics) in laboratory and demonstrate application in two technological proofs of concept.

Methods: We conducted laboratory tests to measure quantitative characteristics including effective angle resolution, maximum flexion assistive & resistive force, and system latency. Angle resolution was calculated using custom software as average measured angle range with the exoskeleton in fixed open/closed poses. Forces were controlled through digit-specific parameters, measured as weight using an electronic balance, and converted to force assuming finger length eight centimeters. Latency was measured by applying force and measuring delay to detect angle change. Two proof-of-concept exercises demonstrated exoskeleton application in custom software: pressing virtual buttons with assistance in random sequence (e.g. piano keystrokes), and grabbing a virtual sphere using all digits with physics-based force feedback.

Results: We measured the following characteristics (average ± stdev): effective angle resolution 0.1±0.1 degrees; maximum flexion assistive force 1.8±0.1 newtons; maximum flexion resistive force 7.0±0.6 newtons; system latency 48±5 milliseconds. Exoskeleton obstructed finger hyperextending. Maximum force was not uniform over all flexion range (maximum is reported). We could sense assistive forces to press on virtual buttons, or resistive forces resulting from contact with a virtual sphere.

Discussion: Physical properties were measured and the exoskeleton was used in two proofs-of-concept showcasing angle measurement and assistive/resistive force. Friction in the actuator contributed to higher resistive force than assistive, which may allow higher force feedback during simulation while being safer for users. Assistance is similar to requirement to press a remote control button, whereas resistance is similar to pinch force for pushing a card into an automatic teller machine [3]. In future work, time series of angle measurement may allow modeling of individual pathologies and provide insight to effective treatments for a particular condition. Modulated forces may allow tiered treatments or patient-specific adjustments. Integration within virtual reality may promote user engagement and optimize clinical recovery.

18. Characteristics of an elbow flexion contracture during childhood following brachial plexus birth injury

Presenting Authors: Allison Mah, MScOT Candidate; Karen Ogilvie, MScOT Candidate

Co-Authors: Karen Klar, BScPT; Alison Anthony, MScPT; Kristen M. Davidge, MD, MSc; Howard M. Clarke, MD, PhD; Emily S. Ho, PhD, MEd, BScOT

Introduction: The development of elbow flexion contractures (EFC) in school-age children with Brachial Plexus Birth Injury (BPBI) is common. While these contractures are not present at birth, several reports indicate onset at or prior to 6 months of age and emerging between 2 to 4 years; however, little is known about their development and trajectory. EFC formation and progression in early childhood is a parental stressor and impacts a child's occupational goals.

Purpose: To determine the prevalence and characteristics of EFC during early childhood following BPBI.

Methods: A retrospective cross-sectional study of children with BPBI < 4 years was conducted. Demographic, diagnostic, treatment, and EFC data were extracted from health records and a prospectively collected database. Comparison of the type of BPBI pattern of injury between those with EFC and those who did not was conducted. The motor contributions of C5, C6, and C7 roots were defined using Active Movement Scale (AMS) outcomes between 1 to 3 months of age or the earliest evaluation possible.

Results: Of the 183 children who were < 4 years of age between 2015 and 2019, 171 (77M, 94F) met the inclusion criteria. Of the included children, 87% (n=149) had upper plexus injuries; 15% (n=25) had microsurgical reconstruction of the brachial plexus; and 13% (n=22) had shoulder reconstruction. The mean age at the time of chart review for EFC was 21.5 ± 13.0 months. An EFC was present in 22% (n=38) of the children. The mean EFC onset was 13.4 ± 11.0 months (range: 3.0 to 47.9 months), while the mean documented degree of contracture at its highest magnitude was -10.8 ± -6.9 degrees (range: -5 to -30 degrees). The majority (76%, n=29) of EFCs were < -10 degrees. Treatment for EFC included passive range of motion exercises (73%, n=25), thermoplastic night elbow extension orthosis (18%, n=6) and semi-rigid fibreglass casting (9%, n=3). The mean age at the time of AMS evaluation was 2.3 ± 1.4 months. Children with EFC had significantly lower AMS scores in shoulder abduction, flexion, and external rotation; elbow flexion; forearm supination; and wrist extension than children without EFC (Mann Whitney U, $p<0.001$). All children who developed EFCs had AMS elbow extension scores > 6.

Discussion: This study demonstrates that EFC has greater prevalence in infancy than previously understood in the literature and largely affects those with greater upper trunk involvement. These findings may further the understanding of how C5 and C6 injury leading to denervation of brachialis and bicep brachii contribute to EFC development.

Practice implications: Characterizing EFC development will help plan for rehabilitative needs during early childhood for this chronic condition.

19. A scoping review of the evidence regarding assessment and management of psychological features of shoulder pain

Presenting Author: Maryam Farzad, Post doctorate associate

Co-Authors: Joy C MacDermid, PT PhD; David C Ring, MD; Erfan Shafiee, PhD Candidate

Background and aim: Shoulder pain is second only to low back pain among costs associated with the care of musculoskeletal disorders. Psychological factors, social factors and mental health can contribute to shoulder pain and resulting functional disability. The purpose of this scoping review was to identify the nature of the research that has integrated psychological assessment and treatment in the management of shoulder pain.

Methods: A scoping review of research studies identified through PubMed, EMBASE, and CINAHL and graduate theses identified using Google Scholar was conducted to determine studies and systematic reviews that addressed the management of psychological aspects of shoulder pain with or without neck pain The search terms included psychological factors, anxiety, depression, catastrophic thinking, fear of movement and psychological treatments. Two investigators screened study titles and abstracts. Data extraction, content analysis and thematic coding focused on the dimensions of pain addressed (emotional, behavioral, cognitive) and treatment approaches used (dimensions targeted, specific treatment parameters); and the linkage between treatment targets/rationale with interventions/outcomes measured.

Results: Ten studies (seven randomized trials, three cohorts) were identified that addressed the management of the psychological aspects of shoulder pain. Out of seven RCTs, four compared psychological interventions with usual care. Eight studies used cognitive approaches including emotional freedom techniques (EFT), pain coping strategies (PCS), physical-cognitive-mindfulness training (PCMT), psychological flexibility, face-to-face cognitive-behavioral treatment (CBT), and cognitive therapy using virtual reality (VR). Three studies used behavioral approaches including: Behavioral therapy and Graded Exercise Therapy (GET). Pain intensity was addressed as primary outcome in two studies and as secondary outcome in five studies. Cognitive factors were evaluated in 50% of the articles using nine different measures. Emotional factors were evaluated in 80% articles using ten different measures. Reduction of pain intensity and catastrophic thinking with respect to pain was achieved in most of the studies using a biopsychosocial approach (70%). Applying a behavioral approach was associated with reductions in kinesiophobia and pain catastrophizing. Cognitive approaches had a positive were associated with reductions in the emotional aspect of pain. Only one study specifically linked rationale or specific physical and psychosocial treatment targets with the treatments provided and outcomes measured.

Conclusions: Small pools of studies indicate that the rationale and treatment targeting are poorly defined in biopsychosocial interventions for shoulder pain. Despite this benefits have been demonstrated when cognitive or behavioral components are added to standard physical treatment of shoulder pain. Better definition of treatment targets, description of intervention components and linkage of outcomes to targets is needed to advance our understanding of how to optimize bio psychosocial approaches.

20. Intensity of Chronic Persistent Pain and disability can Accurately Screen for Presence of Pain Catastrophization and Fear of Performing Wrist Movements in Individuals with Distal Radius Fracture

Presenting Author: Maryam Farzad, Post doctorate associate

Co-Authors: Saurabh Mehta, PT, PhD; Joy C MacDermid, PT PhD; Mohammad Mahdavi; Erfan Shafiee, PhD Candidate

Background: The associations of chronic pain and disability after distal radius fractures (DRF) with behavioral and mental health factors (pain catastrophizing, depressive symptoms, and fear of performing wrist movement) and the occurrence of chronic pain and disability after are known. However, approaches to screen for presence of these behavioral impairments are not established.

Questions/Purposes: This study aimed to examine the associations of persistent wrist pain and disability at 6-months after DRF with presence of behavioral or mental health impairments. Importantly, we investigated whether scores for wrist pain and disability obtained at 6-months after DRF can accurately screen for presence of pain catastrophizing, depressive symptoms, and fear of performing wrist movements.

Methods: Eighty-five patients with DRF were evaluated for wrist pain and disability with subscales of Patient-rated wrist evaluation (PRWE-P and PRWE-F), 6-months after the fracture. The patients also completed the Pain Catastrophizing Scale (PCS), the Tampa Scale of Kinesiophobia (TSK), and the Depression & Anxiety Stress Scale (DASS). The associations of wrist pain and disability with presence of these behavioral and mental health factors at 6-months after DRF were examined using multivariable logistic regression models. These models were adjusted for age, sex, type of orthopedic management (open reduction and internal fixation (ORIF) versus percutaneous fixation and external fixation), and education level. The ability of PRWE-P and PRWE-F scores at 6-months after DRF to accurately classify individuals with and without these behavioral and mental health traits were examined using the area under the receiver operating characteristic curve (AUC).

Results: Higher PRWE-P scores were significantly associated with worse pain catastrophizing (OR 1.57 [95% CI 1.18 to 2.12]; $p = 0.002$), having depressive symptoms (OR 1.25 [95% CI 1.02 to 1.53]; $p = 0.03$), and fear of performing wrist movements (OR 1.27 [95% CI 1.13 to 1.43]; $p<0.0001$). In addition, higher PRWE-F scores were also highly associated with worse pain catastrophizing (OR 3.1 [95% CI 1.2 to 8.01]; $p = 0.019$), having depressive symptoms (OR 1.34 [95% CI 1.02 to 1.75]; $p = 0.03$), and fear of performing wrist movements (OR 1.39 [95% CI 1.17 to 1.64]; $p<0.0001$). The PRWE-P or PRWE-F Scores of ≥18/50 showed the best combination of sensitivity and specificity in accurately identifying individuals with pain catastrophizing, depressive symptoms, and fear of performing wrist movements at 6-months after DRF (AUC values of ≥0.88).

Conclusion: The results of this study further validate the associations of chronic wrist pain and disability with pain catastrophizing, depressive symptoms, and fear of movement at 6-months after DRF. The novel finding of this study is that scores of ≥18/50 PRWE-P or PRWE-F can be used to screen for presence of these behavioral and mental health traits.

21. Pain at Rest, Movement Evoked Pain, and their Ratio Predict Pain and Disability at Six- and 12-Months after Distal Radius Fracture

Presenting Author: Maryam Farzad, Post doctorate associate

Co-Authors: Saurabh Mehta, PT, PhD; Joy C MacDermid, PT PhD; Ruby Grewal, MD, FRCSC; Erfan Shafiee, PhD Candidate

Introduction/Aim: To examine the associations of indicators of pain such as pain at rest (PAR), movement evoked pain (MEP), and the ratio between those (MEPR) assessed at 8-weeks following distal radius fracture (DRF) with occurrence of chronic pain or disability at 6- and 12-months after the injury. The study also examined whether these pain indicators can classify individuals who do or do not transition to chronic pain and disability.

Method: Scores for the pain and function subscales of patient-rated wrist evaluation (PRWE) were extracted for 8-weeks, 6- and 12-months after DRF from an existing dataset. The associations between pain indicators with chronic pain and disability were examined using nonlinear quartile and logistic regressions. The area under the curve (AUC) obtained to examine the accuracy of the predictors in classifying those who experienced chronic pain and disability after DRF.

Results: A total of 229 participants with completed data were included in the study. The PAR ≥3 (AUC of 0.77), and MEP≥6 (AUC of 0.78) predicted moderate to severe pain at 6-months after DRF. MEP of ≥7 predicted disability (AUC of 0.79) at 6-months. A score of 2≤or ≥8 of MEPR was associated with adverse outcomes at 6- and 12-months, but prediction accuracy was low (AUC≤ 0.50).

Conclusion: Pain at rest was more predictive of chronic pain, while pain with movement was more predictive of disability. The scores for PAR ≥3, and MEP ≥7 at 8-weeks should serve as a red flag for risk of chronic pain and disability after DRF.

22. Factors associated with disability and pain intensity in patients with CRPS

Presenting Author: Maryam Farzad, Post doctorate associate

Co-Authors: Joy C MacDermid, PT PhD; Tara Packham, PhD, OT Reg. (Ont.); Erfan Shafiee, PhD Candidate

Questions/Purposes: This study aimed to examine the associations of persistent pain and disability in patients with CRPS with presence of psychological factors (pain catastrophizing, pain-related anxiety and fear of pain). Furthermore, we investigated whether scores for pain and disability can accurately screen for presence of pain catastrophizing, depressive symptoms, and fear of performing movements.

Methods: One hundred and two patients with a diagnosis of CRPS were evaluated for pain and disability with and the Quick Disabilities of the Arm, Shoulder and Hand questionnaire (Q-DASH), and pain intensity at rest and movement evoked pain with items from the pain subscales of patient rated wrist and had (PRWHE). The patients also completed the Pain Catastrophizing Scale (PCS), the Tampa Scale of Kinesiophobia , and the Depression & Anxiety Stress Scale. The associations of pain and disability with presence of these behavioral and mental health factors were examined using bivariate and multivariable analysis. These models were adjusted for age, sex, injured dominant hand, and previous surgery. The ability of Q-DASH and pain score (at rest and evoked with movement) to accurately classify individuals with and without the indicators of unhelpful behavioral and mental health traits were examined using the area under the receiver operating characteristic curve (AUC).

Results: Higher movement evoked pain (b=0.23, p=0.00), and greater level of pain catastrophizing (b=0.42, p=0.00), was associated with greater disability. Being female and greater level of pain catastrophizing accounted for 19% variance of pain at rest score. Scores of ≥ 47 on Q-DASH, ≥ 3.5 on pain at rest and ≥ 6.5 on movement evoked pain maximized the combination of sensitivity and specificity in identifying individuals with pain catastrophizing.

Conclusion: The results of this study further validate the associations of chronic pain and disability with pain catastrophizing in patients with CRPS. The novel finding of this study is that scores of ≥ 47 on Q-DASH, and ≥ 3.5 on pain at rest and ≥ 6.5 on movement evoked pain can be used to screen for presence of these behavioral and mental health traits.

23. Zone II Flexor Tendon Repair by Modified FDS repair (X manner) Technique followed by Place and active holding: a case series

Presenting Author: Maryam Farzad, Post doctorate associate

Co-Authors: Hossein Abdolrazaghi; Joy C MacDermid, PT PhD; Fereydoun Layeghi; Erfan Shafiee, PhD Candidate

Background: The importance of using strong repair in flexor tendons has been well described. Bulky strong repairs increase the risk of bunching of the repaired tendon and jeopardize the outcomes. This study's objective was to determine whether using a simultaneous epitenon, core suture on flexor digitorum profundus (FDP), and a simple X manner flexor digitorum superficialis (FDS) followed by Place and active hold method affect the outcomes.

Method: From February 2019 to August 2020, thirty- two patients with zone 2 injuries enrolled in this study. All tendons were repaired with a simple X manner suture for FDS and four-strands core suture plus epitenon suture for FDP. The C1 or A3 pulleys were incised as necessary. The repaired hand was immobilized with dorsal blocking splint with the wrist in 0-30, MCP joints in 70-90 degrees of flexion and IP in full extension. The place and active hold (PAH) method was used postoperatively for six weeks. The outcome was evaluated by means of flexion contracture and total active motion (TAM) and interpreted using Strickland criteria and categorized as excellent, good, fair and poor. The linear regression model detected predictors of outcomes.

Results: No repairs were ruptured, and 24(52%) digits achieved good or excellent motion six weeks after surgery using the Strickland criteria. According to the Strickland criteria, 41(89%) digits ranked as excellent and good with no poor result at a three-month follow-up. Four patients had 5 to 10 degrees of flexion contracture. Age was the only predictor of TAM at six weeks and accounted for 13% of its variation. Improvement of TAM from six weeks to three months was related to age and flexion contracture in six weeks.

Conclusions: The simple X manner for FDS can be considered a safe technique for applying early motion with certain practical advantages and without rupture and no significant flexion contracture. This suture is strong enough to prevent gapping at the tendon repair site. Further research with larger sample size or randomized clinical trials is necessary.

24. Clinical Application of 3D Printed Orthoses for Musculoskeletal Conditions of the Elbow, Wrist and Digits

Presenting Author: Deborah A Schwartz, OTD, OTR/L, CHT

Co-Author: Katherine Schofield, DHS, OTR/L, CHT

Introduction: 3D printed orthoses are emerging as a possible option in the field of hand therapy to replace conventional casts and orthoses. It remains unclear whether they are a viable option to replace customized thermoplastic orthotic fabrication. The clinical conditions of the upper extremity that are currently being treated with 3D printed orthoses are unidentified and the various outcome measures used to address the efficacy of these devices are undetermined.

Purpose of the Study: To examine the nature and quality of the evidence regarding the clinical use of 3D printed orthoses for the upper extremity using a systematic review process.

Methods: A comprehensive literature search was carried out using CINAHL, PubMed, Medline, ProQuest, and EBSCO databases with the following search terms: 3D printing; orthoses, splint, or brace; elbow, wrist, hand, and digits. The selected studies had to identify patients with musculoskeletal conditions affecting the elbow, wrist, hand or digits. The quality of the studies was assessed using Structured Effectiveness for Quality Evaluation of Study (SEQES).

Results: Ten studies described the utilization of 3D printed orthoses with patients in the treatment of musculoskeletal conditions of the elbow, wrist, and digits. Study designs included case studies, case series, prospective clinical trials and randomized clinical trials. The studies were evaluated using the Structured Effectiveness of Quality Evaluation of Study (SEQES) with scores of the ranging from 15-32 out of a possible 48 points. Outcome measures included pain scales, functional assessments, patient satisfaction questionnaires, time and cost. Two specific outcome measures (OPUS) and QUEST) addressed the specifics of wearing 3D printed orthoses. Diagnoses included fractures, wrist pain, burns, arthritis, and mallet finger. Seven studies out of the ten included 3D printed orthoses for the wrist with a total of 136 participants. Distal radius fracture was the most common diagnosis. Three studies out of ten included 3D printed orthoses for the digits with a total of 12 patients. Diagnoses included median and ulnar neuropathy, hand burns and thumb base arthritis.

Conclusion: The current level of evidence to support the use of 3D printed orthoses for clinical conditions of the elbow, wrist, and digits is low. Factors that influence the implementation of 3D printed orthoses in clinical practice include the high cost of equipment, lengthy fabrication and learning time requirements of clinicians, and inability to objectively compare 3D orthoses with custom molded orthoses. Limitations of our review include the lack of high-quality evidence, specifically randomized controlled trials, and a paucity of studies on the use of 3D printed orthosis in a clinical setting.

25. Developing a Functional Modified Ring Orthosis to Correct DIP Joint Deformity in String Instrumentalists

Presenting author: Allison Shearer, MOT, OTR/L, CHT

Co-authors: Julius Bruder, BSc; Josephine van Lier; Erik Visser; Christine Guptill, PhD, OT Reg. (Ont.)

Introduction: Due to the repetitive nature of playing a musical instrument, musicians are prone to developing playing-related musculoskeletal disorders. These disorders can cause pain, limit musicians' ability to play their instrument, and sometimes even necessitate playing cessation1. In string instrumentalists, the left hand is held in a curved position and the fingers are responsible for manipulating the strings on the neck of the instrument. For cello in particular, the playing position places a significant amount of strain on the fingers and the index finger is often forced into ulnar deviation at the distal interphalangeal (DIP) joint.

The client described is a professional cellist with osteoarthritis. She presented with deformity of the index finger DIP joint, which was positioned at approximately 10° of ulnar deviation at rest. Additionally, she experienced pain and intermittent edema localized to the DIP joint. She expressed concern about further exacerbation of the joint deformity and her long-term playing ability. She required an orthosis to maintain her left index finger DIP joint in a neutral position for playing.

Methods: Over-the-counter splinting options were considered, but they did not provide an appropriate fit. As such, a custom orthosis was fabricated to reduce DIP joint strain. The purpose of the orthosis is to maintain the DIP joint in a neutral position while still allowing adequate DIP flexion needed to depress the cello strings. Multiple prototypes were tested before a final product was crafted out of sheet metal; the pliability of the metal and open design can accommodate changes in edema.

The orthosis employed a modified ring style design which permitted functional but not full flexion of the DIP joint and did not restrict proximal interphalangeal (PIP) joint motion. Two semi-open rings are connected by a solid bar on the ulnar aspect of the orthosis. The radial aspect of each ring is left partially open for donning, doffing, adjustment of fit, and necessary contact with the cello strings. The ulnar bar connecting the rings is critical to the orthosis design. Due to its placement adjacent to the joint, the bar counteracts varus forces. As such, the orthosis ensured neutral positioning of the DIP joint and allowed for functional use of the index finger while playing cello.

Results: A combination of factors–namely repetitive joint strain from playing cello and the progressive joint damage and instability associated with osteoarthritis–were likely the source of the client's swelling and joint deformity. Use of a modified ring-style orthosis while playing reduced reported osteoarthritis-related complications of the index finger secondary to joint deformity. Psychological benefits were also evident: the client indicated that she felt her joint was more secure and stable while wearing the orthosis, which reduced her anxiety surrounding future disease progression and quelled some fears about her long-term ability to continue playing cello.

Conclusion: Custom orthoses can address the biomechanical stressors associated with playing an instrument, and successfully manage the effects of osteoarthritis joint deformity in musicians.

Natasha wears two MCPDrivers.

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