Table 2
Rates of change between major time points for patient population and surgical groups

Outcome Variable	Δ baseline to 12 weeks	Δ from baseline to poorest rating	Δ from poorest rating to return to baseline level	Δ poorest rating to 3 months
DASH				
All Patients	1.22	7.86	16.23	5.76
Nerve Decompression	1.26	10.54	21.89	7.16
Nerve Reconstruction	0.96	6.20	17.59	3.34
SF-8 PCS				
All Patients	0.51	3.66	5.32	1.91
Nerve Decompression	0.40	2.35	8.50	1.77
Nerve Reconstruction	0.67	6.75	10.47	3.14
SF-8 MCS				
All Patients	0.18	4.60	5.28	1.14
Nerve Decompression	1.06	7.12	10.65	2.69
Nerve Reconstruction	0.57	9.30	5.60	0.22
Pain				
All Patients	1.85	11.17	5.05	3.04
Nerve Decompression	2.26	8.97	8.63	3.28
Nerve Reconstruction	1.15	15.46	41.97	2.66

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Early Implementation of Sensorimotor Retraining for Cortical Reintegration in Postoperative Rehabilitation in an Bilateral Above Elbow Allotransplantation

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Purpose: The goal of postoperative rehabilitation after hand transplantation is to enhance the quality of life, improve arm and hand function and raise an individual's level of self-esteem. Despite the lack of established protocol for this population, literature is in agreement that cortical reintegration is imperative in achieving optimal functional outcomes for those with a transplanted limb. Published case studies on transplant patients by Dubernard and Geatz demonstrated changes in cortical maps were reversed with restoration of motor and tactile sensation. This case study describes the implementation of early phase sensorimotor retraining for a patient having undergone the first bilateral above elbow arm transplantation.

Methods: The patient is a 35 year old male who sustained bilateral above elbow traumatic amputation in May 2012. He successfully received bilateral arm transplantation in November 2017. Hand therapy was provided daily beginning the day after surgery with focus on passive ROM for both hands, positioning, edema management and fabrication of custom molded bilateral arm and hand orthoses modified periodically as determined by changes in arm girth. Adaptation and environmental modifications were implemented to enhance independence in basic self-care tasks. Graded exercises for the trunk and arms were introduced based on strength, motor control gains and tissue healing. Frequency of therapy was changed to 5 days a week under outpatient setting after discharge from acute care.

Sensorimotor training was initiated 10 days after surgery with graded motor imagery focusing on left/ right discrimination, visualization techniques and imagined movements. The use of mirror therapy was not applicable but to aid lateralization training, a computer program was downloaded to his iPad which he could access using his right foot. At 4 weeks, NMES (VMS FR) at sensory threshold was introduced to create "noise" on both long hand flexors and extensors. At 8 weeks after surgery, surface EMG was added to his sensorimotor retraining program targeting his biceps and triceps. This added another level of feedback as he worked towards meeting target muscle contraction. Using a BTE Primus, shoulder eccentric strengthening following controlled contraction for internal and external rotation was initiated 10 weeks after surgery. At week 14, gaming devices were added to his sensorimotor retraining program with alternating use of the Xbox Kinect for active shoulder motions, Boba exercise board device while weight bearing on his elbows and the Hocoma Armeo Spring device for supported arm movements. The gaming devices provided kinesthetic and proprioceptive feedback of his transplanted arms. Alternating between the gaming devices, use of EMG and BTE allowed multiple sensorimotor facilitation and feedback until his discharge to another facility at week 19.

Results: At six weeks after surgery and discharge from acute care, the patient was able to perceive manual deep pressure at approximately 2 inches past his bilateral upper arm volar incision lines. At 8 weeks, it improved approximatelt to 3 inches and using a 6.65 mm SW monofilamnet, he perceived sensation 1 cm below his right upper volar arm incision and 2.5 cm for his left. Note that he had significant post-surgical edema that could affect response. With the introduction of EMG, measurements using average work were taken on his biceps and triceps at 8 and 12 weeks with gains of 20-48 uV for the right and 28-48Uv for the left. At 19 weeks and discharge from this facility, MMT for right elbow flexion and extension was 2+/5 with trace forearm supination and left elbow flexion and extension was 2/5 with trace forearm supination. He could also perceive a 6.65 mm SW monofilament 5 inches distal his right volar incision line and 6 inches for the left. He reported that his phantom limb sensation still persisted but improved as it is "tied" to an actual limb and that all the sensorimotor retraining has helped him know where his arms are in space. Monthly assessments have since been completed to determine progress and return in function as he continued his therapy in another facility. At 10 months, he demonstrated left index finger active mobility and at 1 year, emerging bilateral middle finger active mobility.

Conclusion: There are common themes in rehabilitation protocols and data collection in the different centers that provide hand transplantation procedures. However, every patient will require their own unique treatment plan [1]. This case study shows the successful implementation of early phase sensorimotor training using various rehab techniques and modalities. Due to the nature of this case study, no conclusion can be reached regarding its efficacy, however, positive gains in sensation and motor control were objectively established. Future studies investigating the rehabilitation procedures for this patient population should consider early phase sensorimotor training as part of the rehabilitation protocol.

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Upper Extremity Pain in Breastfeeding Mothers: A Narrative Review of the Literature

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Purpose: Breastfeeding is an occupational activity that requires repetitive use of the upper extremities. Some women may experience upper quarter pain with this activity. The purpose of this narrative review of the literature is to summarize the scientific literature regarding upper extremity or neck pain that mothers may experience with breastfeeding, in order to understand the problem and inform hand therapy examination and interventions for this population.

Methods: Databases were searched using keywords including "breastfeeding," "pain," "neck or back or upper extremity," "posture," "position" and "ergonomics." Studies investigating prevalence or risk of pain in the upper extremity or neck were included. Nipple pain or breast pain alone were not included. No publication date restrictions were used. Results were extracted and summarized.
Results: Six studies were retrieved from the databases CINAHL, PubMed, Google Scholar, and MEDLINE, including 4 prevalence studies, and 2 studies describing risk factors of upper quarter pain related to breastfeeding. Hand and wrist complaints during pregnancy include tendonitis, carpal tunnel syndrome, and cubital tunnel syndrome; one study found a prevalence of 20.9%, 10.2%, and .3% respectively for these conditions in pregnancy. The prevalence of postpartum primary neck and shoulder (including the superior part of the trapezium muscles) pain in Japanese women one month postpartum was 73.1%. First-time mothers were found to have increased rates of shoulder stiffness, back pain, and wrist pain at 1 month postpartum compared to younger mothers and mothers who had multiple children. The most common areas of pain in breastfeeding mothers in another study involved the neck (20.5%), followed by neck and shoulder (16.5%), and back and neck (12.6%). Older first-time mothers that breastfeed have been found to have a higher incidence of carpal tunnel syndrome. Researchers in Hong Kong found a nearly significant difference in new onset wrist pain in 259 mothers who breastfed versus those who did not breastfeed (OR = 2.58, p = .051); being a first-time mother was found to be significantly predictive of wrist pain in the early postpartum period (OR = 2.62, p = .01).
Conclusion: It has been established in the literature that breastfeeding mothers may experience pain in the wrist, shoulder and neck. Postural deficits as well as the repetitive nature of the activity may put mothers at risk of neuromusculoskeletal disorders in the upper quarter. Breastfeeding mothers may benefit from screening for these issues by health care professionals and may benefit from interventions for prevention and treatment of this pain. These interventions could include manual therapy, therapeutic exercise, splinting, posture re-education and use of ergonomic aids. An interdisciplinary approach may be beneficial. More research is needed to understand risk factors for this pain and the mechanisms of injury, prevalence in the United States, and interventions that may prevent or manage upper quarter pain associated with breastfeeding.

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Aota Critically Appraised Paper Series Evidence Exchange *A Product of the American Occupational Therapy Association Evidence-Based Literature Review Project

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Purpose: Ultrasound and paraffin wax therapy are common treatment modalities that may be used by occupational therapists. This study focused on the efficacy of each modality, in combination with a wrist orthosis, in treating patients with carpal tunnel syndrome to relieve symptoms and improve function. Modalities and splints are preparatory methods that can decrease pain and promote healing, in preparation for occupational performance (American Occupational Therapy Association [AOTA], 2014). Physical agent modalities, if used, must be incorporated with occupational therapy interventions as a preparatory method for the purpose of regaining function for occupations (AOTA, 2014). The authors hypothesized that ultrasound therapy Would be more effective in treating carpal tunnel syndrome. The results determined that, when in combination with a wrist orthosis, ultrasound was more effective than paraffin therapy for improving functional status (as measured by the Boston Carpal Tunnel Syndrome Questionnaire) among patients with mild–moderate carpal tunnel syndrome.
- Compare the effectiveness of ultrasound versus paraffin wax, both in combination with a wrist orthosis, for patients with carpal tunnel syndrome, to determine which treatment method was the most effective for improving the patient's functional status
- Assess the patient's pain levels, symptom severity, sensitivity, palmar pinch strength, and motor activity of the median nerve

Methods:
DESIGN TYPE AND LEVEL OF EVIDENCE:

This was a randomized trial with no control group. The level of evidence is level two.

SAMPLE SELECTION
How were subjects recruited and selected to participate? Please describe.

Sixty individuals diagnosed with Carpal Tunnel Syndrome were recruited from the Department of Physical Medicine and Rehabilitation in one community hospital during 2010 and 2011.

Inclusion Criteria

Patients were required to have subjective symptoms (pain and/or numbness in the median nerve distribution of the digits or nocturnal pain). Patients were required to have either a positive Phalen's sign or a positive Tinel's sign along with electrophysiological evidence of Carpal Tunnel Syndrome.

Exclusion Criteria

Patients were excluded if 1) They were younger than 18 years of age 2) Had any underlying medical disorders, such as diabetes mellitus, renal failure, autoimmune disease or hypothyroidism, and 3) Pregnancy, or previous wrist trauma or surgeries.

SAMPLE CHARACTERISTICS

N= (Number of participants taking part in the study)		**60 allocated to groups, 47 completed**	
#/ (%) Male	5 (10.6%)	#/ (%) Female	42 (89.4%)
Ethnicity		NR; study completed in Taiwan	
Disease/disability diagnosis		Carpal Tunnel Syndrome	

INTERVENTION(S) AND CONTROL GROUPS
Add groups if necessary
Group 1

Brief description of the intervention	Paraffin therapy group: Patients wore custom-fabricated neutral wrist orthoses at night for eight weeks. The patients wore the orthoses for eight weeks. The paraffin wax treatment was performed in the hospital twice a week for eight weeks. A dip-and-wrap method was used, which included dipping the affected extremity into a wax bath that was fifty-five degrees Celsius five times. The extremity was covered with plastic wrap and a towel for twenty minutes before the wax was removed from the extremity.
How many participants in the group?	There were 23 participants in the paraffin therapy treatment group.
Where did the intervention take place?	Department of Physical Medicine and Rehabilitation at the Taipei Tzuchi Hospital
Who Delivered?	Physical Therapists
How often?	Twice per week
For how long?	8 weeks