Case study: returning to work after burns to the left hand

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Case Study:

Returning to Work After Burns to the Left Hand

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Note: This document describes a Capstone Dissemination project reflecting an individually planned experience conducted under faculty and site mentorship. The goal of the Capstone Experience is to provide occupational therapy doctoral students with unique experiences whereby they can demonstrate leadership and autonomous decision-making in preparation for enhanced future practice as occupational therapists. As such, the Capstone Dissemination is not formal research.
Abstract

Mr. B was a fifty three year old right hand dominant male who sustained third degree burns from a motor vehicle accident. Burns were located on his left leg, flank, and hand. He spent several months in a burn unit in the southern part of the United States where he underwent several grafting procedures, including full sheet grafts to the dorsal aspect of the left middle and ring fingers, dorsal and lateral aspect of the small finger, and a portion on his left hypothenar eminence. He was transferred to St. Vincent Mercy Medical Center, in Toledo, Ohio to continue treatment closer to home. Upon discharge from the inpatient burn unit, Mr. B was seen at St. Vincent’s outpatient clinic due to decrease range of motion and function of his left hand.

Upon evaluation, Mr. B was unable to make a fist with his left hand, was hypersensitive to touch, rated grooming and household management tasks as moderately difficult. He had a goal of returning to work, where he would be spending a large amount of time keyboarding, in one and a half months.

Treatment sessions included use of scar massage, ultrasound, active and passive range of motion, coordination and dexterity tasks and keyboarding. Pressure garments were monitored and patient/family education were a part of every treatment session. Mr. B was discharged from St. Vincent’s outpatient program and care was transferred to therapist closer to his employer. At a one month follow up with the patient, Mr. B reported his keyboarding speed and accuracy at approximately 90% and was able to make a functional fist without prior range of motion or modalities.
Case Study: Returning to Work after Burns to the Left Hand

Introduction

Overview

Mr. B is a fifty three year old Caucasian male who sustained third degree burns to his left leg, flank, and hand from a motor vehicle accident. After the accident, Mr. B was admitted to a burn unit in the southern United States where he underwent several grafting surgeries. Mr. B was then airlifted to St. Vincent Mercy Medical Center to continue treatment closer to home. Mr. B was being seen by physical therapy for impairments to the leg and flank, followed by the burn clinic physicians at St. Vincent Mercy Medical Center for monitoring of graft healing and pain management, and under the care of occupational therapy secondary to decreased range of motion and function of Mr. B’s left hand.

Models of Practice

The biomechanical model of practice was the primary practice model used during therapeutic treatment sessions with Mr. B. The “basic concern of the biomechanical model is the musculoskeletal capacities that underlie functional motion in everyday occupational performance” (Kielhofner, 2004). This is further supported in the evaluation process of Mr. B, as range of motion measurements as well as functional questionnaires were used to monitor changes in performance. Also in accordance with the application of the biomechanical model of practice, Mr. B’s limitations were due to trauma to the musculoskeletal system, peripheral nervous system, as well as the integumentary system (Kielhofner, 2004). Finally, goals associated with Mr. B’s treatment plan are parallel to the three concepts that explain the capacity of motion, in
accordance to the biomechanical model of practice: range of motion, strength and
endurance (Kielhofner, 2004).

Additional models of practice concepts used during the treatment of Mr. B were
the Model of Human Occupation and the Medical model. In regard to the Model of
Human Occupation, Mr. B was an active participant in the determination of treatment
occupations. His volition, what he felt was important and enjoyable, was the main drive
behind using typing occupations in treatment sessions. He was also able to derive
feedback from the occupation to interpret how effectively the occupation was
accomplished and together with the therapist; recommendations were made to increase
the performance capacity of the task in the future. The medical model of practice was
also used throughout treatment of Mr. B, as part of the treatment plan was aimed at
containing the effects of the trauma and natural healing process of grafted skin by
monitoring and working against scar tissue growth and shrinkage of grafted skin via
manipulation of the skin (Kielhofner, 2004).

Choice of Case Study Participant

Mr. B was chosen for this case study because of his diagnostic uniqueness in the
population of patients I had been seeing at my clinical placement. His evaluation had
added components of skin integrity, graft healing, and use of compression garments in
addition to the standard range of motion and upper extremity functioning forms typically
used with upper extremity diagnoses. In addition, Mr. B’s diagnosis gave me an
opportunity to further explore the healing process of the integumentary system, the role
of the occupational therapist in burn care, as well as grafting options and splinting for
patients with burns. Finally, Mr. B was a patient that embraced the educational process
of a new therapist and taught me information he had learned regarding burns along his journey and gave me insight on the psychosocial issues he has been dealing with since his accident.

Evaluation

Background Information

As previously discussed, Mr. B is a 53 year old right hand dominant male who sustained third degree burns to a significant portion of the left side of his body after a motor vehicle accident in October 2007. For the purpose of this case study, the focus was the burns sustained on the left hand. Mr. B reported undergoing surgeries in October 2007 and December 2007 for skin grafts and revisions. Other pertinent medical history included reports of high blood pressure, blood clots, difficulty sleeping, and chronic fatigue. Mr. B reported taking oxycodine for pain as well as a water pill, blood thinner and an antibiotic. Prior to the accident, Mr. B described himself as healthy and active. He holds a position at a local institution where he spends the majority of his day returning emails, attending meetings, and typing reports. He planned to return to his job in approximately one and a half months. Hobbies included reading and enjoying the outdoors with his wife.

Evaluation

Burns were located on the dorsal aspect of the left middle, ring, and small fingers as well as the lateral and volar aspect of the small finger. The proximal and distal phalanx were affected, however the metacarpals were unharmed. A golf ball size area of the hypothenar eminence was also burned. All areas were grafted using a full sheet graft from Mr. B’s upper inner thighs. The finger tips were not grafted. The grafted areas
were reddened with some purple areas around the edges of the graft on the hypothenar eminence. All areas were raised and hard. At evaluation, Mr. B was wearing an isotoner compression glove and had been measured for custom compression garments the day prior.

Range of motion of the left shoulder, elbow, wrist and thumb were all within functional limits. The left digits ranges of motion were as follows:

<table>
<thead>
<tr>
<th>Digits AROM</th>
<th>Index</th>
<th>Middle</th>
<th>Ring</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCP</td>
<td>-10/93</td>
<td>-17/104</td>
<td>-20/95</td>
<td>-5/88</td>
</tr>
<tr>
<td>PIP</td>
<td>+7/67</td>
<td>-5/62</td>
<td>-25/70</td>
<td>-20/50</td>
</tr>
<tr>
<td>DIP</td>
<td>-1/15</td>
<td>+10/8</td>
<td>+5/7</td>
<td>+5/8</td>
</tr>
</tbody>
</table>

In comparison, the right digits ranges of motion were as follows:

<table>
<thead>
<tr>
<th>Digits AROM</th>
<th>Index</th>
<th>Middle</th>
<th>Ring</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCP</td>
<td>/77</td>
<td>/87</td>
<td>/87</td>
<td>/98</td>
</tr>
<tr>
<td>PIP</td>
<td>/107</td>
<td>/107</td>
<td>/107</td>
<td>/90</td>
</tr>
<tr>
<td>DIP</td>
<td>/64</td>
<td>/81</td>
<td>/64</td>
<td>/81</td>
</tr>
</tbody>
</table>

A composite fist was attempted; however none of the fingers were able to touch the palm of the hand. The majority of the movement came from the unaffected MCP’s.

Sensation evaluation found Mr. B’s fingertips to be hypersensitive to touch, as he reported the towel on the clinic table felt “like rough sandpaper”. No other sensation evaluation was completed at the time of the evaluation due to the decreased skin integrity of the fingers.
A site specific functional questionnaire was completed. Mr. B rated opening a jar, using hands to eat, cut food and hold a glass, washing under opposite arm, pushing a vacuum, and using a computer as moderately difficult. He was unable to drive due to decreased range of motion of left hand and apprehension due to his car accident.

Mr. B rated his pain as a 7/10, which he further described as a constant aching on the dorsal aspect of his left digits and the dorsal-ulnar aspect of the left hand. After soft tissue mobilization of the fingers the patient reported mild relief and activity after a period of immobility increased the pain.

Dexterity and strength were not assessed on the day of evaluation, as the patient was unable to approximate for dexterity and pinch testing, and was unable to make a composite fist for grip testing. Moderate edema was noted in the index, middle, ring, and small fingers.

Mr. B’s chief complaint was a decrease in movement in the hand and inability to use the left hand for the majority of his functional tasks. His major goal was to be able to return to work in a month and a half, which would require him to be able to use the keyboard to respond to a large number of emails and type reports each day.

Goal Setting

*Patient Goals for Therapy*

Long Term Goal 1:

To be able to return to work by March 1, 2008 and carry out all functions with minimal errors on keyboard task.
Short Term Goal:
To have isolated control of fingers on left hand as evidenced by independent flexion/extension and abduction/adduction of each finger in three weeks.

Short Term Goal
To be able to type on a keyboard, incorporating both hands in four weeks.

Short Term Goal
To be able to type on a keyboard, incorporating both hands and with no more than minimal typing errors in five weeks.

Occupational Therapy Goals

Long Term Goal 1
Pain will be reported as less than or equal to 3/10 with all functional tasks in 24 visits.

Short Term Goal
Pain will be reported as less than or equal to 5/10 with all functional tasks in 12 visits.

Long Term Goal 2
Patient will be able to make a loose fist, with 25-35 degrees of DIP flexion in all left digits, in 24 visits.

Short Term Goal
Patient will be able to actively touch all pads of left digits to palm of hand in 12 visits.

Long Term Goal 3
Patient will report no difficulty with opening a jar, using hands to eat, cut food and hold a glass, washing under opposite arm and pushing a vacuum as measured by the functional questionnaire, in 24 visits.
Short Term Goal

Patient will report no more than minimal difficulty with opening a jar, using hands to eat, cut food and hold a glass, washing under opposite arm, and pushing a vacuum, as measured by the function questionnaire, in 12 visits.

Other Goals:

Patient will be able to approximate to a lateral, two and three point pinch pattern in 12 visits.

Patient will be able to make a composite fist that registers grip strength on the dynamometer in 12 visits.

Interventions

*Primary Therapeutic Interventions Used*

**Massage**

Massage techniques were used to maintain mobility by freeing restrictive fibrous bands and in increasing circulation (Grigsby deLinde & Miles, 1995). A lanolin based cream was used as a lubricant and deep pressure was applied to the graft sites, in small circular and “x” patterns to decrease adhesions and contractures as well as desensitize the graft areas (Pessina & Orroth, 2002). The patient and his wife were educated on this technique and massage was performed several times a day at home in conjunction with therapy.

**Ultrasound**

Ultrasound to the dorsal aspect of the left middle, ring and small finger at 3 MHZ frequency; pulsed 50% duty cycle; 0.5-0.9 w/cm², 4 minutes each was used in conjunction with massage prior to activities to increase extensibility of soft tissue
collagen and tissue pliability at graft sites (Weiss & Falkenstein, 2007). In addition, ultrasound can provide temporary pain relief by an increase in blood flow and temperature in the graft area, which better allows the patient to focus on the task at hand.

Range of Motion

During the rehabilitation phase of scar maturation, wound closure until the scar becomes pale, there continues to be an increased rate of collagen synthesis which required Mr. B to actively and passively range his hand several times per day to prevent contractures (Pessina & Orroth, 2002). Active range of motion included isolated tendon gliding and full digit flexion and extension. Passively, each joint and digit were moved independently and taken to the point of blanching and held for 5 second increments. After this was completed, place and hold exercises were completed where the therapist brought Mr. B’s fingers as far as he would allow into a composite fist. The therapist then pulled her hands away from Mr. B’s fist and he was asked to hold the position to the best of his ability for 5 seconds. All exercises had a goal of 10 repetitions each session, however Mr. B’s pain level and endurance was monitored and repetitions were gauged accordingly. In addition, self report of pain was carefully monitored to ensure exercises were not too aggressive, which could have lead to tissue tears, edema, and increased joint stiffness (Pessina & Orroth, 2002). Finally, Mr. B and his wife were educated on range of motion techniques which they completed several times per day at home.

Pressure

Mr. B used custom fitted pressure gloves that were ordered through Barton-Carey Medical Products. His gloves had closed fingertips, due to the decreased skin integrity of his fingertips, and had no zippers or Velcro. The pressure glove was used to provide
prolonged, evenly dispersed pressure over the left hand to flatten and smooth the scars. While the evidence supporting the use of pressure garments on patients with burns is still debated, several ideas have been supported by research. Several researchers found that when blood flow to the rapidly metabolizing collagenous tissue of the scar site was decreased under approximately 25mm Hg of pressure, the hypoxia changed the metabolic pathways of scar growth and maturation (Kirscher & Shetlar, 1979). Other researchers believe the use of pressure garments lead to dehydration of the scar site, thus temporarily diminishing the size of the scar (Jensen & Parshley, 1984). The patient and his wife were educated on proper donning and doffing technique to prevent skin shearing and skin integrity was monitored by the therapist.

Primary Occupational Forms

The primary occupational form for Mr. B’s therapy sessions was in an outpatient clinic. The clinic was a large open room with gym equipment spanning the majority of the space. In the back right corner of the clinic, a square of space had four therapy tables in a semi-circle along with two therapist stools, a cart with file folders and a cabinet that held therapeutic equipment. Mr. B always sat at the table to the left and placed his cane, he used while walking, against the cart with the file folders. The therapist sat directly in front of Mr. B on a stool. The session always began with the therapist sanitizing her hands with sanitizer kept on the cart. Scar massage was performed using the therapist’s hands and Nivia cream stored on the cart. Ultrasound of the dorsal aspect of the middle, ring, and small fingers was then performed using the ultrasound machine, kept to the left of where Mr. B sat. The therapist then passively ranged Mr. B’s left digits one at a time, then as a composite fist. Additional equipment used during therapy sessions included a
towel used for desensitization of the left finger tips, a pillow case for DIP crunches, as well as a variety of peg boards and a keyboard to work on digit dexterity and coordination.

**Therapeutic Occupation- Typing at the Computer**

The treatment session used for this case study was the first session Mr. B. used a computer and keyboard to type. Like all other treatment sessions, it lasted an hour and began with the therapist massaging and using ultrasound at the graft sites. Mr. B. completed active range of motion exercises and the therapist passively ranged all digits. After completing range of motion exercises, the patient’s compression glove was donned with the help of the therapist. The therapist took Mr. B. into the staff office where a computer, keyboard, and mouse was set up on a desk. Only one other therapist was in the office at the time of the session and the room was quiet. Mr. B sat directly in front of the computer and the therapist sat to the left side of Mr. B. The session began by Mr. B. placing his hands properly on the keyboard, using the guide letters “F” and “J” for his left and right index fingers. The therapist began by calling out random letters which required both left and right finger movement. This was first done in order to get the fingers used to moving independently from the rest of the fingers on the left hand. Mr. B. displayed no difficulty with this task. Next, the therapist called out patient relevant words, such as book and tree, for the patient to type. Mr. B. took approximately twice the normal time to locate the letters and correctly spell the words. The therapist gave several verbal cues for Mr. B. to continue incorporating the left digits while typing, as he was trying to compensate by using the right hand for the majority of the typing. The session continued
by using sentences and longer paragraphs. Several issues were noted throughout the entire treatment session at the computer:

1. Difficulty incorporating the left hand into typing
2. Striking the wrong key with the left hand
3. Holding down the selected key too long with the left hand
4. Significantly slower typing speed

From these issues, several re-synthesis recommendations were discussed with Mr. B.:

1. Larger keyboards were discussed and shown to Mr. B. to help with the accuracy of typing, as his finger tips still lacked placement accuracy due to a change in sensory input secondary to the burns and bulk of compression glove.
2. Accessibility options for the keyboard were located and discussed. It was found that making the keys on the keyboard less sensitive to his touch decreased the number of mistakes made due to holding the button down too long (ie: ooooo)
3. Make a conscious effort at home to continue incorporating left hand while typing, working, reading, etc.
4. Begin to return emails at home for practice in keyboarding and in a low pressure environment where Mr. B. could focus on correct technique.
5. Speak to fabricators of compression glove to discuss options of a “work glove” that allows the finger tips to be exposed for better sensory input while at the computer.
Assessment information gathered during the typing treatment session was as follows:

1. The left hand continues to have sensory disturbances that need to be monitored. Compensatory techniques, safety issues, and desensitization tasks continued to be used and discussed.

2. The left digits were able to be moved individually, continue to focus on speed and accuracy of movements.

3. Mr. B. was apprehensive about returning to work the following week. He joked and laughed at his inaccuracy and slow speed, however frustration was evident in his wavering voice that was not present prior to difficulty in the treatment session.

Outcomes

Mr. B’s discharge from therapy was premature due to the location of his job, however his care was transferred to an occupational therapist closer to work where he continues to make progress. Mr. B. will continue with occupational therapy well into the summer to ensure his function does not regress due to the healing nature of skin grafts. The information provided below was Mr. B’s status when he was discharged from the therapist’s care in Toledo. A one month follow-up was also completed at Mr. B’s current therapy location.

Goals

Long Term Goal 1:

To be able to return to work by March 1, 2008 and carry out all functions with minimal errors on keyboard task. **MET**
Short Term Goal:
To have isolated control of fingers on left hand as evidenced by independent flexion/extension and abduction/adduction of each finger in three weeks. **MET**

Short Term Goal
To be able to type on a keyboard, incorporating both hands in four weeks. **MET**

Short Term Goal
To be able to type on a keyboard, incorporating both hands and with no more than minimal typing errors in five weeks. **PROGRESSING**

*Occupational Therapy Goals*

Long Term Goal 1

Pain will be reported as less than or equal to 3/10 with all functional tasks in 24 visits. **MET**

Short Term Goal

Pain will be reported as less than or equal to 5/10 with all functional tasks in 12 visits. **MET**

Long Term Goal 2

Patient will be able to make a loose fist, with 25-35 degrees of DIP flexion in all left digits, in 24 visits. **MET (at new therapy location)**

Short Term Goal

Patient will be able to actively touch all pads of left digits to palm of hand in 12 visits. **MET**
Long Term Goal 3

Patient will report no difficulty with opening a jar, using hands to eat, cut food and hold a glass, washing under opposite arm and pushing a vacuum as measured by the functional questionnaire, in 24 visits. **ONGOING**

Short Term Goal

Patient will report no more than minimal difficulty with opening a jar, using hands to eat, cut food and hold a glass, washing under opposite arm, and pushing a vacuum, as measured by the function questionnaire, in 12 visits. **MET**

Other Goals:

Patient will be able to approximate to a lateral, two and three point pinch pattern in 12 visits. **MET**

Patient will be able to make a composite fist that registers grip strength on the dynamometer in 12 visits. **MET**

*Range of Motion Progress*

The following tables depict measurements taken at discharge from therapy at Toledo, and at a one month follow up.

**Discharge from Toledo 2/21/08 (Degrees of change from initial evaluation 1/17/08)**

<table>
<thead>
<tr>
<th>Digits AROM</th>
<th>Index</th>
<th>Middle</th>
<th>Ring</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCP</td>
<td>(↑25)+15/88(↑5)</td>
<td>(↓2)-19/103(↓1)</td>
<td>(↑12)-8/95</td>
<td>(↑3)-2/92(↑4)</td>
</tr>
<tr>
<td>PIP</td>
<td>(↑1)+6/95(↑28)</td>
<td>(↓2)-8/70(↑8)</td>
<td>(↑5)-20/85(↑15)</td>
<td>(↑5)-25/65(↑15)</td>
</tr>
<tr>
<td>DIP</td>
<td>(↓1)-2/30(↑15)</td>
<td>(↑5)+5/30(↑22)</td>
<td>(↓5)-0/26(↑19)</td>
<td>(↓7)-2/25(↑17)</td>
</tr>
</tbody>
</table>
One Month Follow Up 3/24/08 (Degrees of change from Toledo discharge 2/21/08)

<table>
<thead>
<tr>
<th>Digits AROM</th>
<th>Index</th>
<th>Middle</th>
<th>Ring</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCP</td>
<td>/94 (↑6)</td>
<td>/98 (↓5)</td>
<td>/90 (↓5)</td>
<td>/86 (↓6)</td>
</tr>
<tr>
<td>PIP</td>
<td>/80 (↓15)</td>
<td>/65 (↓5)</td>
<td>(↓1)-21/66(↓19)</td>
<td>*(↓7)-32/68(↑3)</td>
</tr>
<tr>
<td>DIP</td>
<td>/41(↑11)</td>
<td>/41(↑11)</td>
<td>/34 (↑8)</td>
<td>/41(↑16)</td>
</tr>
</tbody>
</table>

* Flexion Contracture- began splinting on 3/24/08

Other Assessment Changes

As discussed earlier, Mr. B. met the goal of being able to make a fist that registered on the dynamometer and approximate to a lateral, three point, and two point pinch pattern. The following table shows grip and pinch strength changes from 2/21/08 to 3/24/08:

<table>
<thead>
<tr>
<th>(measurements in pounds)</th>
<th>2/21/08 Right</th>
<th>2/21/08 *Left</th>
<th>3/24/08 Right</th>
<th>3/24/08 *Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grip</td>
<td>88</td>
<td>39</td>
<td>83</td>
<td>48 (↑9)</td>
</tr>
<tr>
<td>Lateral Pinch</td>
<td>20</td>
<td>19</td>
<td>22</td>
<td>20 (↑1)</td>
</tr>
<tr>
<td>Three Point</td>
<td>16</td>
<td>8</td>
<td>16</td>
<td>13 (↑5)</td>
</tr>
<tr>
<td>Two Point</td>
<td>17</td>
<td>12</td>
<td>14</td>
<td>10 (↓2)</td>
</tr>
</tbody>
</table>

* Affected hand

In addition to a general increase in strength, Mr. B reported no more than minimal difficulty with functional tasks that required an increase in strength, such as pouring a gallon of milk. Other deficits listed on the functional questionnaire were described as minimally difficult, compared to the initial evaluation questionnaire where most items were marked as moderately difficult.
When asked, Mr. B. reported he still has difficulties throughout his day at home and at work, but he sees improvements everyday. He is now able to make a functional fist without prior stretching, drives to work everyday with both hands on the wheel, and reports his typing is at about 90% the speed and accuracy it was prior to his accident.

Conclusion

The discharge recommendation for Mr. B. was a transfer of care to an occupational therapist closer to his work. Recommendations include continuing therapy sessions two-three times per week and focusing on left hand range of motion, strength, and endurance, as described by the biomechanical model of practice (Kielhofner, 2004). Since Mr. B.’s burns have entered the Rehabilitative Phase, which spans from closure of the burned area until the scar matures, therapy sessions should continue to incorporate active range of motion, passive range of motion, strengthening, sensory monitoring, scar management, massage, and patient directed functional tasks (Pessina & Orroth, 2002).
References


