



USE OF MODIFIED COCK-UP SPLINT IN PATIENT WITH BOXER'S FRACTURE & EARLY FUNCTIONAL RECOVERY-A CASE STUDY

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**ABSTRACT**

**Background:** Boxer's Fracture is a colloquial term for a fracture of fifth metacarpal bones of the hand. On closed reduction, hand is immobilized in half cock-up plaster cast. This leads to difficulty in daily living activities & active participation in functional activities, especially for homemaker women, when they have young children. For resolving this difficulty, customised splint was moulded for young lady. She was given a forearm & hand-based orthosis, made of low thermoplastic material covering medial aspect of forearm & ulnar side of hand. This had permitted functional pronation & supination. The results showed improvement in performance in daily activities. Canadian Occupational Performance Measures (COPM) scores improved for performance in self-care from 3 to 6, productivity 2 to 7, leisure 3 to 7; Satisfaction scores improved from 2 to 8, in all activities. Michigan Hand Outcome Questionnaire (MHQ) showed improvement in scores pre and post intervention from 33.27 to 72.89. On Visual Analog Scale pain reduced 7 to 3. The appropriate immobilization of hand & the customized design of splint reduced the functional difficulties & improved the performance in home making tasks. Planning intervention for early return to functional activities is a challenge to occupational therapist.

**KEYWORDS :** Boxer's Fracture, COPM, Functional Abilities, Satisfaction

**INTRODUCTION**

A Boxer's fracture is a fracture of the fifth metacarpal neck, named for the classic mechanism of injury in which direct trauma is applied to a clenched fist. This represents 10% of all hand fractures.<sup>1</sup> The diagnosis of a boxer's fracture is done with an x-ray. The symptoms of a boxer's fracture vary depending on extent of damage to bone & severity of displacement.<sup>2</sup> A boxer's fracture is typically immobilized with a cast in order to correct bone alignment and prevent the client from using the hand with force while making a fist.<sup>1</sup> This further leads to difficulty in daily living activities & lessen active participation in functional activities.

To reduce these difficulties forearm & hand-based splint, made up of low thermoplastic material, covering antero-posterior medial aspect of forearm & ulnar side of hand, was given.

This treatment is designed to limit immobilize the fracture site and permit early use of affected hand to decrease functional limitations. The aim of our study is evaluating the immediate functional outcome, while using the custom-made splint.

**METHODS**

The study was conducted in tertiary care government hospital. Patient consent was taken using Helsinki guidelines. 32 years female with alleged History of fall on the out stretched fist hand, diagnosed as boxer's fracture, managed conservatively with half cock-up cast for 1 week. Patient was a Rehabilitation Therapist by profession working in the multidisciplinary government hospital, had difficulty in performing self-care activities & managing household chores including child care. She had 2 daughters aged 3 years & one and half years. Addition to that, she had difficulties while using public transport & performing professional activities.

**Occupational Therapy Intervention**

After taking due consent from orthopaedic surgeon & using procedural clinical reasoning the cast was replaced with modified custom-made splint of low-temperature thermoplastic material.

The splint was covering antero-posterior medial aspect of the forearm extending up to middle phalanx of 4<sup>th</sup> & 5<sup>th</sup> fingers for 3 weeks; The patient was allowed to use remaining three fingers. The functional ability was assessed three days after providing the splint on Canadian Occupational Performance

Measures (COPM)<sup>3</sup> & Michigan Hand assessment questionnaire (MHQ). MHQ has high Test-retest reliability ranging from 0.81 for the aesthetics scale to 0.97 for the ADL scale and internal consistency, Cronbach's alphas ranged from 0.86 for the pain scale to 0.97 for the ADL<sup>4</sup>. Pain intensity was assessed on Visual Analogue Scale.<sup>5</sup> The patient reported decreased pain & more independence in performing functional activities.

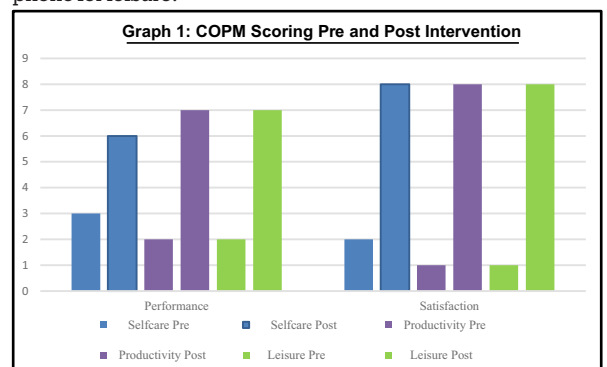


**Fig.1: Modified Cock-up Splint**

**RESULTS**

Follow up was taken after 3 days of using the Modified Cock-up splint.

She was evaluated using COPM.<sup>6</sup> Patient showed preference for achieving independence in self-care activities, child-care and professional activities, as in productivity & use of cell-phone for leisure.



In graph 1, patient score of performances on preferred activities improved 3 to 6 for self-care, 2 to 7 for productivity & 2 to 7 for leisure, satisfaction scores has improved to level 8 post intervention.

MHQ was administered pre and post intervention to assess the functional performance & satisfaction of hand in ADL as well as professional tasks.<sup>7</sup>

**Table 1: MICHIGAN HAND OUTCOMES QUESTIONNAIRE (MHQ) SCORING & Pain on Visual Analog Scale**

DOMAINS	PRE-INTERVENTION	POST-INTERVENTION
Overall hand function	25	80
Activities of daily living	16.29	93.21
Work	10	85
Pain	90	50
Aesthetics	50	37.5
Satisfaction	8.33	91.66
MHQ SCORE	33.27	72.89
VISUAL ANALOG SCALE SCORES	7	3

As per table 1, MHQ showed marked improvement in scores after use of splint, in turn relating to activities of daily living & work performance (93% & 85% respectively), with high level of satisfaction. Pain Assessment was done using Visual Analog Scale. reduce in scores indicated a decrease in pain after providing with splint, post replacement of cast from 7 to 3.

## DISCUSSION

The Modified Cock-up splint was moulded using all guidelines. Immobilization of most metacarpal fractures follows a few simple guidelines, including the following: Fracture splints should be forearm-based and should allow for motion of the interphalangeal (IP) joints. Splints should extend over the dorsal and palmar aspect of the entire metacarpal being treated.<sup>9</sup> Also in another guidelines it is indicated that a gutter splint or cast should be used to immobilize a metacarpal fracture, leaving the thumb, index, and ring fingers free.<sup>3,10</sup> Splinting of metacarpal head fractures should incorporate the MCP joint.<sup>11</sup> This involves slightly extending of the wrist, placing the MCP joint between 70° and 90° of flexion and extending the PIP and DIP joints. This recommendation was followed while moulding the customized splint, which resulted in much reduced pain perception with satisfaction<sup>8</sup>. Conventionally, surgeons prefer to give the cast which immobilizes the forearm in pronation, non-functional position. In this case, we moulded the splint on the medial side of forearm & ulnar half of hand, covering volar & dorsal aspect of hand for 5<sup>th</sup> metacarpal fracture.

Furthermore, the use of splint had decreased the discomfort & improved her satisfaction. In another review Strub et al stated that performed a prospective pseudorandomized trial compare splinting without reduction to closed reduction with bouquet pinning for closed fifth metacarpal neck fractures with 30°–70° of palmar angulation. This led to greater patient satisfaction. Options include buddy taping to the ring finger with immediate motion or 4 weeks of immobilization in a splint or cast. The length of immobilization should be based on tenderness on clinical exam.<sup>11</sup> In our study, the pain had reduced on VAS from 7 to 3 within 3 days.

The objective of this study was to improve functional outcomes and satisfaction in the client. Splintage provided faster improvement in performance scores as well as satisfaction in performing daily task. Client was given some time interval to adjust to a new brace. The client showed increased functional ability with the splint on day 3 after giving the cast.

In a study by Bohr & others, have improved the concepts of cast making with modern material to overcome common

complications such as arthrofibrosis, inflammatory tenodesis, or contracture formation and negative impact on the time of return to "normal hand activity". Their objective was to achieve stability and rigidity at the site of injury (e.g., fracture retention and to allow free range of motion as early as possible following injury). Their study had shown improved functional outcome.<sup>12</sup> Also earlier proposed by Bunnell, Bohler, Kleinert et al, as early as in the 1940s, use of polymerised mouldable material, which keep immobilization to a minimum and are consistent with the principle of early functional treatment. The score after using partial hand orthoses for 5<sup>th</sup> metacarpal fracture for case series was (N=17); score-mean = 32.37 ± 2.53 SD; DASH follow-up interval (weeks): 11.26 ± 1.17 SD).<sup>13,14</sup> In our study when functional hand use was evaluated on day 3 using MHQ it showed significant improvement on total score from 33.27 to 72.89. However, in our study we did not take long term follow up on outcome measures. But client reported immediate resumption on her duty after 4 weeks of immobilisation in the splint. She had continued night use of splint for next 6 weeks as advised by surgeon.

## CONCLUSION

Long term follow up may guide us for recommending this intervention. Besides medical importance, such a model is of economical interest, as the direct costs of operative treatment (e.g., intramedullary wiring inclusive of removal of hardware) are much higher than treatment by low temperature thermoplastic splint. The functional outcome has also the higher impact on patient's satisfaction & compliance. Planning intervention for early return to functional activities is a challenge to occupational therapist. The appropriate immobilisation of hand & the customised design of splint decreased the functional difficulties & improved the daily performance in home making activities.

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