ORIGINAL ARTICLE

EFFECT OF CORTICOSTEROID ON POST-OPERATIVE PAIN AND SWELLING IN PATIENTS UNDERGOING OPEN REDUCTION AND INTERNAL FIXATION FOR ZYGOMATICO-MAXILLARY COMPLEX FRACTURES

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ABSTRACT

Zygomatic bone fracture can cause significant disfigurement due to its prominence and complex anatomical location if proper surgical intervention is not provided. Surgical approaches in this region are associated with complications and morbidities ranging from mild swelling and pain to severe threat to vital function and esthetics. The purpose of this study was to compare the effect of post-operative administration of corticosteroids with non-steroidal anti-inflammatory agents in terms of pain and swelling in patients operated for Zygomatic complex fractures.

This randomized control trial was carried out in the department of Oral and Maxillofacial Surgery at Khyber College of Dentistry Peshawar. A total of 100 patients with Zygomatic complex fracture were recruited in this study. The patients were randomly allocated to two different groups by using prepared randomizations in sealed envelopes. In group 1, dexamethasone 8 mg was injected intraoperative and 4mg IV B.i.D for 48 hours postoperatively along with ibubrufen or diclofenac sodium while in group 2, only ibubrufen or diclofenac sodium alone were used. The degree of severity of pain was assessed by Visual Analog Scale ranging from no pain to severe pain categories on a 100 mm scale. The severity of the edema was estimated according to the criteria set by Torres. Analysis was done using SPSS version 20. Descriptive statistics were used to find out the frequencies and percentages for age, gender and type of fracture. Chi square and Fisher's exact test were used for repeated measures for category rating scale, Pain and swelling. The level of significance was set at $P < 0.05$.

Out of 100 subjects, 71 were male while 29 were female with a male to female ratio of 2.44:1.The mean age of the participants was 31.73 ± 12.7 years. Majority of the fractures were Type 4 (49%) followed by Type 3 fractures (33%). The pain and swelling intensity scores were significantly lower in Group 1 (Dexamethasone given) as compared to Group 2 (no Dexamethasone given) at 24 hours and 48 hours postoperatively ($p<0.5$). No statistically significant difference was found between the study and control groups in terms of pain and swelling during the first 12 hours postoperatively.

Administration of dexamethasone in patient undergoing open reduction and internal fixation of zygomatic complex fractures have a profound effect on the reduction and prevention of pain and swelling as compared to those who received no dexamethasone after 12 hours.

Key words: *Zygomatic complex fracture, dexamethasone, corticosteroid, Maxillofacial surgery*

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INTRODUCTON

Zygomatic bone is the most prominent part of the facial skeleton, and can cause significant esthetic disfigurement as a result of trauma and subsequent fractures.

This bone has a very complex anatomical location, attached to multiple bones of facial skeleton, namely maxilla, frontal and nasal bone.[1]

The most common cause of Zygomatic complex fracture is road traffic accident followed by interpersonal violence and sports injuries. These fractures may occur in isolation or in combination with other fractures like mid-face, nasoethmoid and mandible. When occur with maxillary and orbital fractures, they are considered to

be the most difficult fractures to treat.[2,3]

Various treatment modalities include close reduction through intraoral approach or Gillis temporal approach and open reduction with internal fixation. In the later, the approach is either done intraorally or extra orally depending upon the type and site of fracture and fixation technique.[4] The most popular approach for buttress fixation is Keen's approach and for frontozygomatic suture area is lateral eyebrow approach. Infra orbital rim is approached through infra orbital incision.[5] All these approaches are associated with complications and morbidities ranging from mild swelling and pain to severe threat to vital function and esthetics.[6]

Mild post-operative pain and swelling may be controlled by the administration of non-steroidal anti-inflammatory agents because their inhibitory effect on the prostaglandins and prostacyclins at surgical site may prevent pain and edema.[7]

The trigger point of inflammatory substances may initially be blocked by corticosteroids thus preventing postoperative pain and swelling. Combined effect of non-steroidal anti-inflammatory agents and corticosteroids like dexamethasone will lead to effective pain and edema control in patients with Zygomatic complex fracture and periorbital surgery.[8,9]

The purpose of this study was to compare the effect of intraoperative and post-operative administration of corticosteroids with non-steroidal anti-inflammatory agents in terms of pain and swelling in patients operated for Zygomatic complex fractures. This will provide an evidence for the routine use of short term corticosteroid in cases where post-operative pain and edema control is required as in zygomaticomaxillary complex fracture.

MATERIAL AND METHOD

This randomized control trial was carried out in the department of Oral and Maxillofacial Surgery at Khyber College of Dentistry Peshawar, Khyber Pukhtunkhwa during a period from January 2017 to December 2017. After formal permission from Institutional ethical review board, a total of 100 patients irrespective of gender who sustained Zygomatic complex fracture and required open reduction and internal fixation of fractured sites were recruited in this study. Patients with age below 14 and above 60 years were excluded from the study. Undisplaced fractures, comminuted fractures and those associated with orbital floor fracture were also excluded from this study. All the fractures were operated by a senior consultant with a minimum of 3 years' experience in trauma management, at Day 7 of injury with no pain and swelling. Fractures were classified according to Henderson[10] as:

Type 1 Undisplaced

Type 2 Zygomatic arch

Type 3 Tripod fracture — Intact FZ suture

Type 4 Tripod fracture — Distracted FZ suture

Type 5 Associated orbital floor fracture

Type 6 Orbital rim fracture

Type 7 Comminuted and other fracture

Those with systemic comorbidities like hypertension and diabetes were excluded from the study. The patients were randomly allocated to two different groups by using prepared randomizations in sealed envelops. In group 1, dexamethasone 8 mg was injected perioperative and 4mg IV B.i.D for 48 hours postoperatively along with ibubrufen or diclofenac sodium while in group 2, only ibubrufen or diclofenac sodium alone were used.

The degree of severity of pain was assessed by Visual Analog Scale[11] ranging from no pain to severe pain categories on a 100 mm scale. The severity of the edema was estimated according to the criteria set by Torres et al[11]. as;

Absent	With full eye opening
Mild	Eyelid edema not covering the iris edge
Moderate	Edema extends past the iris edge
Severe	Edema kept the eyelid closed

The presence of peri-orbital edema was assessed every 12 hours postoperatively till 48 hours of surgery. Information so collected was analyzed using SPSS version 20. Descriptive statistics were used to find out the frequencies and percentages for age, gender and type of fracture. Chi square and Fisher's exact test were used for repeated measures for category rating scale, Pain and swelling. The level of significance was set at $P < 0.05$.

RESULTS

A total of 100 patients were recruited in this study and equally distributed into groups 1 and Group 2. Male (71%) outnumbered female (29%) in a ratio of 2.44:1.

The mean age of the participants was 31.73 ± 12.7

TABLE 1: CLASSIFICATION OF FRACTURES

Type of Fracture	Frequency (%)
Type 4	49 (49)
Type 3	33 (33)
Type 6	16 (16)
Type 2	2 (2)
Total	100 (100)

TABLE 2: PAIN RECORDED AT 12, 24 AND 48 HOURS

Variable	Category	Dexamethasone given	No dexamethasone given	P Value
Pain Recorded at 12 hours PO	No pain	3(42.9%)	4(57.1%)	0.11*
	Vas 1-3 (mild pain)	16(69.6%)	7(30.4%)	
	Vas 4-7 (moderate pain)	31(44.9%)	38(55.1%)	
	Vas 8-10 (severe pain)	0(0.0%)	1(100.0%)	
Pain Recorded at 24 hours PO	No pain	10(90.9%)	1(9.1%)	0.01* ≤
	Vas 1-3 (mild pain)	28(59.6%)	19(40.4%)	
	Vas 4-7 (moderate pain)	11(31.4%)	24(68.6%)	
	Vas 8-10 (severe pain)	1(14.3%)	6(85.7%)	
Pain Recorded at 48 hours PO	No pain	34(85.0%)	4(15.0)%)	0.00*
	Vas 1-3 (mild pain)	14(28.0%)	36(72.0%)	
	Vas 4-7 (moderate pain)	1(12.5%)	7(87.5%)	
	Vas 8-10 (severe pain)	1(25.0%)	3(75.0%)	

- *Fisher exact Test
- **Chi Square Test
- P value ≤ 0.05 as significant.

TABLE 3: SWELLING RECORDED AT 12, 24 AND 48 HOURS

Variable	Category	Dexamethasone given	No dexamethasone given	P Value
Swelling Recorded at 12 hours PO	Absent	11(61.1%)	7(38.9%)	0.28*
	Mild	21(50.0%)	21(50.0%)	
	Moderate	16(42.1%)	22(57.9%)	
	Severe	2(100.0%)	0(0.0%)	
Swelling Recorded at 24 hours PO	Absent	11(73.3%)	4(26.7%)	0.00 *
	Mild	24(64.9%)	13(35.1%)	
	Moderate	13(31.0%)	29(69.0%)	
	Severe	2(33.3%)	4(66.7%)	
Swelling Recorded at 48 hours PO	Absent	18(85.7%)	3(14.3%)	0.01**
	Mild	26(66.7%)	13(33.3%)	
	Moderate	5(17.9%)	23(82.1%)	
	Severe	1(8.3%)	11(91.7%)	

- *Fisher exact Test
- **Chi Square Test
- P value ≤ 0.05 as significant.

years (range, 18-56 years; group 1: 31.04 ± 13.2 years and group 2: 32.42 ± 12.3 years). The radiographic analysis of the type of ZMC fracture showed that majority of the fractures were Type 4 (49%) followed by Type 3 fractures (33%). Detail of Classification of fracture type is given in Table-1.

The pain and swelling intensity scores were significantly lower in Group 1 (Dexamethasone given) as compared to Group 2 (no Dexamethasone given) at 24 hours and 48 hours postoperatively (p<0.5). No sta-

tistically significant difference was found between the study and control groups in terms of pain and swelling during the first 12 hours postoperatively.

DISCUSSION

Epidemiological surveys on maxillofacial injuries tend to vary with socio geographic region, culture, religion and point of time in which these investigations have been carried out.[12] In the present investigation, male in their age ranging between 18 and 56 years outnumbered female with a ratio of 2.44:1. In a conservative society like Pakistan[13], especially Khyber pukhtukhwa, the social values are such that female are confined to indoor environment and they usually do not drive cars and motorcycles. On the contrary male are responsible for such outdoor jobs and are therefore more prone to injuries and accidents. Similar results were shown by Das et al.[14] and Kovacs et al.[15] in terms of the mean age and age range. They also have shown a male predominance with a male to female ratio of 5.5:1 and 4:1 respectively.

Majority of the fractures of zygomatic complex in the present study were Type 4 (49%) followed by Type 3 fractures (33%). Gandi et al.[16] while conducting clinical study of two point fixation of zygomatic complex fracture using wire and mini plates, stated that Type III and Type IV were the most common fracture patterns followed by Type II. Results of a number of national and international studies have shown the tripod (type IV and III) to be the most prevalent fracture pattern. Another reason for these similar results is that majority of these studies including the present investigation, were conducted on patients where, open reduction and fixation were required for the treatment of these fractures[6,17,18].

Surgical trauma and subsequent manipulation in patients with zygomatic complex fractures can lead to a significant degree of tissue edema and pain, manifested postoperatively. Application of local cold to the area of surgery and administration of analgesics is a common and beneficial practice among the Oral & maxillofacial surgeons[19]. The pain and swelling intensity scores in this study were significantly lower in Group 1 (Dexamethasone group) as compared to Group 2 (non-Dexamethasone group) at 24 hours and 48 hours postoperatively ($p<0.5$). Although there was no statistically significant difference between the study and control groups in terms of pain and swelling during the first 12 hours postoperatively.

Research workers like Kyzas et al [20], Seymore et al[21], Grossi et al [22], and Benetello et al [23], working on the mechanism of pain and swelling and their management in the oral and maxillofacial region have suggested that surgical intervention in this region either for trauma or elective procedures can lead to a significant degree of tissue trauma that again causes an inflammatory reaction. Which can lead to postoperative symptoms of pain and swelling in the region of surgery. Seymore [21] stated that pain and swelling approach to maximum intensity in the first 48 to 72 hours after surgery, significantly affecting the patient's quality of life and well-being. So minimization of these unwanted effects is crucial to achieve maximum patient satisfaction after treatment. In order to reduce the intensity of postoperative pain and swelling, the role of corticosteroids and non-steroidal anti-inflammatory drugs cannot be brushed aside[22,23].

Working on the healing mechanism of facial bone fractures, Snall et al [24] showed that delayed healing occur when corticosteroids were administered to a patient with mandibular angle fracture. They attributed this delay in the healing process to a change in osteocyte and osteoblast activity and increase bone resorption. The result of the study performed by Snall et al. cannot be generalized to all maxillofacial fractures and the quality of bone in the lower jaw is totally different from that of the midface.[24] Moreover, that study was performed only on 37 patients where the other causes of infection and delayed wound healing were not probably controlled.

The use of corticosteroid has not yet reached full acceptance in Maxillofacial surgery.There is no clear evidence, that a short term preoperative administration of glucocorticoids shows the reported side effects[25].

Semper-Hogg et al[26] while studying on 38 patients who underwent orthognathic surgery, administered 40 mg dexamethasone and concluded that glucocorticoids significantly decrease postoperative edema after orthognathic surgery.

This study is the first of its kind in the Khyber Pukhtunkhwa province where we were able to show that low doses corticosteroids at General anesthesia induction and up to 48 hours postoperatively have beneficial effects in reduction and prevention of postoperative pain and edema.

CONCLUSION & RECOMMENDATION

It was concluded from the results of the present study that, co administration of dexamethasone along with Ibubrufen or Diclofenac in patient who underwent open reduction and internal fixation of zygomatic complex fractures have a profound effect on the reduction and prevention of pain and swelling as compared to those who received no dexamethasone. Steroids are preferable to be administered at induction for surgery and continuing 48 hours postoperatively.

LIMITATIONS

Number of surgical sites opened and fixed as well

as the type of incisions were not considered in the statistics, which might have influenced the results of this study. Moreover, small sample size might have influenced some portions of the statistical tests.

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4 Tariq Ahmad:	helped in data analysis discussion.
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6 Farhad Ali:	Read the proof.
7 Mohammad Ajmal Khan:	Helped arrangement of data.