

## Retrospective Comparison of One Point Fixation versus Two Point Fixation in the Treatment of Tripod Fractures.

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**Introduction:** Tripod fractures constitute of zygomatic bone and its four articulations viz; frontal bone, maxillary bone, sphenoid bone and temporal bone. When ever a Tripod fracture happens, one or more of these articulations are interrupted. Up to 40% of all facial fractures fall into this category. The prominence of this bone results in high incidence of its fracture. Motor vehicle accident is the most common cause.<sup>4</sup> There are various approaches for open reduction of this fracture which include lateral eyebrow incision, sub ciliary, sub tarsal, trans conjunctival and maxillary vestibular incision.

**Aim:** The purpose of this retrospective study was to compare one point fixation with two point fixation for isolated zmc fractures.

**Materials And Methods:** Sixty patients with isolated tripod fractures which reported to the dept of dental surgery, KAP Vishwanatham medical college, Trichy from 2016-2018 were included in this retrospective study with 30 patients in each of the two groups. The surgical treatment planned in group 1 patients was one point fixation at zygomaticomaxillary buttress and in group 2 patients was two point fixation at frontozygomatic and zygomaticomaxillary buttress region. The inclusion criteria were isolated fractures of zygomaticomaxillary complex. The exclusion criteria were severely comminuted fractures, infected fractures and orbital fractures for both group 1 and 2 patients. The surgical procedure in **GROUP 1** patients included a maxillary vestibular incision. In **GROUP 2** patients, lateral eyebrow incision was given along with maxillary vestibular incision

**Results:** All the patients underwent open reduction and internal fixation. Comparing the surgery time, the treatment time in Group I patients was 30 minutes and in Group II patients, 55 minutes showing that one point fixation had shorter operating time and lesser costs involved

**Conclusion:** Two-point fixation is superior in stability over one point fixation. However it had various disadvantages which included, longer operating time, increased cost of the surgery, implant palpability and unaesthetic scars. But the fixation at the ZM buttress was quicker and without earlier disadvantages but fixation was inadequate in case of extensively comminuted or displaced fractures. So we conclude that one point fixation at zygomatic buttress is a cost effective, swift and reasonably stable option for isolated ZMC fractures.

**Keywords:** zygomatic complex, mini Plates, Tripod fracture, one point fixation

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### I. Introduction

Up to 40% of facial fractures constitute of Tripod fractures<sup>1</sup>, male population is more affected with an incidence of F:M- 1: 4.<sup>2</sup> Tripod fractures include those injuries that disrupt the four articulations of the zygoma with the adjacent cranial bones. These articulations are with the frontal bone at FZ suture, maxillary bone at zygomaticomaxillary suture, Temporal bone at zygomaticotemporal suture and the sphenoid bone at zygomaticosphenoid suture.<sup>3,15</sup> Due to disruption various signs and symptoms of zygomatic fractures appear which include sub conjunctival haemorrhage – flame sign, periorbital oedema, numbness in area of ION distribution, enophthalmos, diplopia, limitations of jaw movement as when the zygomatic arch is depressed medially, the coronoid process strikes against the depressed malar eminence thereby restricting the movement of the jaw and loss of prominence of the malar eminence.<sup>4</sup> The integrity of the zygomatic complex is critical in maintaining normal facial width and cheek prominence.<sup>5</sup> Tripod fracture can be managed with one point or two point fixation, however, the number of sites of rigid fixation still remain a topic of debate.<sup>4,6</sup>

The purpose of this retrospective study was to compare the outcome for one point fixation in zygomatic buttress area and two point fixation in zygomatic buttress and frontozygomatic region in isolated tripod fractures which were treated during the last three-year period with special attention to age, gender, clinical management and complications.

## II. Materials And Methods

Sixty patients with isolated tripod fractures which matched the inclusion criteria were included in this retrospective study with 30 patients in each group. The surgical treatment planned in group 1 patients was one point fixation at zygomaticomaxillary buttress and in group 2 patients was two point fixation at frontozygomatic and zygomaticomaxillary buttress region. The inclusion criteria were isolated fracture of zygomaticomaxillary complex. The exclusion criteria were severely comminuted fractures and infected fractures for both group 1 and 2 patients. In all the patients, the chief complaint was reduced mouth opening and altered facial aesthetics. Clinical parameters assessed in both Groups 1 and Group 2 included intraoperative time taken, scars, palpability of plates, cost of treatment signs of wound infection or dehiscence and need for plate removal. The surgical procedure in GROUP 1 patients included a maxillary vestibular incision in relation and elevation of mucoperiosteal flap and the fracture site at zygomatic buttress was exposed, reduced and fixed with 2mm 4 hole plate and 2X6mm screws and the wound was sutured with 3-0 vicryl (Fig-1.) In GROUP 2 patients a lateral eyebrow incision was given, layer wise dissection was done, periosteum was incised. The fracture site was exposed and zygoma fracture was elevated using Rowe's zygoma elevator and fracture site at frontozygomatic region was reduced and fixed with 1.5mm four hole miniplate and 2X6 mm screws (fig-2 ). sutured with 3-0 vicryl and 3-0 prolene layer wise and the zygomaticomaxillary buttress fracture was addressed in a similar manner as GROUP 1 patients



## III. Results

60 patients, 30 in each group (Group 1 and Group 2), all patients with a mean age of 35 years (20-50 years) diagnosed with isolated tripod fractures were included in the study. (Table - 1) All the patients underwent open reduction and internal fixation. There was depression of malar eminence in all the patients and paraesthesia of infra orbital nerve in 40% of patients. There was diplopia in one patient and restricted mouth opening in 54 patients. The other symptoms seen were oedema, ecchymosis, subconjunctival haemorrhage in 90% of the patients.

In Group 1 the patients which had undergone one point fixation were included i.e. in the zygomaticomaxillary buttress with 2 mm 4 hole plate and 2X6 mm screws. In Group 2 patients which had undergone two point fixation in the zygomaticomaxillary buttress with 2mm 4 hole plate and 2X6 mm screws and fronto-zygomatic fixation using 2mm three hole mini plate and 2X6 mm screws were included. In 65% patients, right side was involved. Clinically the prominence of the malar eminence, infection, wound dehiscence, foreign body reaction, neurological deficit, palpability of the implant was considered. In Group 1 patients, there was persistent paraesthesia of the infra orbital nerve even after six months in one patient. However there was no incidence of wound infection or dehiscence or foreign body reactions or palpability of plates in any patients. In one patient the fixation at one point was unstable and there was bony movement at frontozygomatic region. In Group II patients, there was no paraesthesia in any patient there was no evidence of wound dehiscence or foreign body reactions. However fifteen patients complained of palpability of plates and 10 patients of unsightly scars in frontozygomatic region. Comparing the operating time, the treatment time in Group 1 patients was 30 minutes avg and in Group 2 patients, 55 minutes avg. showing that one point fixation had shorter operating time. (Table 2 and Table 3).

S.no	Age	Sex	Side	Orbital symptom	Depression of malar prominence	Mouth opening	Clinical displacement	Radiological displacement
1.	31	M	R	No	Yes	23mm	f-z region	f-z region & buttress region
2.	41	M	L	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
3.	37	M	R	no	yes	16mm	F-z region	F-z region
4.	21	M	L	No	Yes	20mm	Buttress region	Buttress region
5.	37	M	R	No	Yes	26mm	Buttress region	Buttress region
6.	46	M	L	No	Yes	20mm	F-z region	F-z region & buttress region
7.	28	M	R	No	Yes	42mm	Buttress region	f-z region & buttress region
8.	32	M	R	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region
9.	26	M	R	yes	Yes	40mm	Buttress region	Buttress region
10.	25	M	L	No	Yes	35mm	f-z region & buttress region	f-z region & buttress region
11.	37	M	R	No	Yes	40mm	f-z region	f-z region & buttress region
12.	32	M	L	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
13.	37	M	L	no	yes	38mm	F-z region	F-z region
14.	24	M	R	No	Yes	20mm	Buttress region	Buttress region
15.	31	M	R	No	Yes	40mm	Buttress region	Buttress region
16.	45	M	R	No	Yes	20mm	F-z region	F-z region & buttress region
17.	24	M	L	No	Yes	42mm	Buttress region	f-z region & buttress region
18.	29	M	R	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region
19.	28	M	R	No	Yes	40mm	Buttress region	Buttress region
20.	24	M	L	No	Yes	35mm	f-z region & buttress region	f-z region & buttress region
21.	30	M	R	No	Yes	40mm	f-z region	f-z region & buttress region
22.	26	M	L	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
23.	27	M	L	no	yes	38mm	F-z region	F-z region
24.	30	M	R	No	Yes	20mm	Buttress region	Buttress region
25.	53	M	R	No	Yes	40mm	Buttress region	Buttress region
26.	43	M	L	No	Yes	20mm	F-z region	F-z region & buttress region
27.	36	M	R	No	Yes	42mm	Buttress region	f-z region & buttress region
28.	21	M	R	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region
29.	28	M	L	No	Yes	40mm	Buttress	Buttress region

							region	
30.	27	M	L	No	Yes	35mm	f-z region & buttress region	f-z region & buttress region
31.	33	M	R	No	Yes	40mm	f-z region	f-z region & buttress region
32.	27	M	L	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
33.	46	M	L	no	yes	38mm	F-z region	F-z region
34.	24	M	R	No	Yes	20mm	Buttress region	Buttress region
35.	32	M	R	No	Yes	40mm	Buttress region	Buttress region
36.	20	M	L	No	Yes	20mm	F-z region	F-z region & buttress region
37.	39	M	R	No	Yes	42mm	Buttress region	f-z region & buttress region
38.	29	M	R	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region
39.	32	M	L	No	Yes	40mm	Buttress region	Buttress region
40.	37	M	R	No	Yes	35mm	f-z region & buttress region	f-z region & buttress region
41.	51	M	R	No	Yes	40mm	f-z region	f-z region & buttress region
42.	21	M	R	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
43.	24	M	L	no	yes	38mm	F-z region	F-z region
44.	25	M	R	No	Yes	20mm	Buttress region	Buttress region
45.	32	M	R	No	Yes	40mm	Buttress region	Buttress region
46.	30	M	L	No	Yes	20mm	F-z region	F-z region & buttress region
47.	29	M	R	No	Yes	42mm	Buttress region	f-z region & buttress region
48.	29	M	R	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region
49.	32	M	R	No	Yes	40mm	Buttress region	Buttress region
50.	57	M	R	No	Yes	35mm	f-z region & buttress region	f-z region & buttress region
51.	41	M	R	No	Yes	40mm	f-z region	f-z region & buttress region
52.	49	M	R	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
53.	26	M	L	No	yes	38mm	F-z region	F-z region
54.	29	M	R	No	Yes	20mm	Buttress region	Buttress region
55.	22	M	R	No	Yes	40mm	Buttress region	Buttress region
56.	43	M	L	No	Yes	20mm	F-z region	F-z region & buttress region
57.	19	M	R	No	Yes	42mm	Buttress region	f-z region & buttress region
58.	21	M	R	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region

59.	21	M	R	No	Yes	40mm	Buttress region	Buttress region
60.	23	M	R	No	Yes	35mm	f-z region &buttress region	f-z region &buttress region

Table 1. Demographic Data of the cases included in the study

S.no	Wound Infection/ Dehiscence	Scar	Palpability of plates	Sign of Clinical and radiological union	Operating time
1.	no	no	no	yes	25 mins
2.	no	no	no	yes	35 mins
3.	no	no	no	yes	20 mins
4.	no	no	no	yes	45 mins
5.	no	no	no	yes	40 mins
6.	yes	no	no	yes	25 mins
7.	no	no	no	yes	30 mins
8.	no	no	no	yes	20 mins
9.	no	no	no	yes	25 mins
10.	no	no	no	yes	35 mins
11.	no	no	no	yes	20 mins
12.	no	no	no	yes	25 mins
13.	no	no	no	Yes	35 mins
14.	no	no	no	yes	25 mins
15.	no	no	no	yes	20 mins
16.	no	no	no	yes	45 mins
17.	no	no	no	yes	25 mins
18.	no	no	no	Yes	20 mins
19.	no	no	no	yes	25 mins
20.	no	no	no	yes	25 mins
21.	no	no	no	yes	35 mins
22.	yes	no	no	yes	25 mins
23.	no	no	no	Yes	45 mins
24.	no	no	no	yes	25 mins
25.	no	no	no	yes	40 mins
26.	no	no	no	yes	35 mins
27.	yes	no	no	yes	25 mins
28.	no	no	no	Yes	45 mins
29.	no	no	no	yes	25 mins
30.	no	no	no	yes	40 mins

Table 2. Different study parameters in Group 1

S.no	Wound Infection/ Dehiscence	Scar	Palpability of plates	Sign of Clinical and radiological union	Operating time
1.	no	yes	no	yes	1 hr
2.	no	no	yes	yes	45 mins
3.	no	yes	no	yes	1 hr
4.	no	yes	no	yes	55 mins
5.	no	no	yes	yes	1 hr
6.	no	yes	no	yes	50 mins
7.	no	no	yes	yes	1 hr 15 mins
8.	no	yes	no	yes	40 mins
9.	no	yes	no	yes	55 mins
10.	no	no	yes	yes	55 mins
11.	no	no	no	yes	1 hr 10 mins

12.	no	yes	yes	yes	40 mins
13.	no	no	no	yes	40 mins
14.	no	yes	no	yes	45 mins
15.	no	no	yes	yes	1 hr
16.	no	yes	no	yes	55 mins
17.	no	no	no	yes	1 hr
18.	no	no	no	yes	50 mins
19.	no	no	no	yes	1 hr 15 mins
20.	no	yes	yes	yes	40 mins
21.	no	yes	no	yes	45 mins
22.	no	no	yes	yes	55 mins
23.	no	yes	no	yes	1 hr
24.	no	yes	no	yes	50 mins
25.	no	no	yes	yes	1 hr
26.	no	yes	no	yes	45 mins
27.	no	no	yes	yes	1 hr 05 mins
28.	no	yes	no	yes	55 mins
29.	no	no	no	yes	1 hr
30.	no	no	no	yes	50 mins

Table -3. Different study parameters in Group 2

#### IV. Discussion

Tripod fractures are more common in the 2nd and 3rd decade of life. In the current study, the age of patient ranged from 20-50 years and 58 of them were male and 65% sustained fracture in the right side. The integrity of the zygomatic complex is critical in maintaining normal facial width and cheek prominence so the most important principle in the treatment of zygomaticomaxillary complex fractures is 3 dimensional reduction.<sup>15-18</sup> But the treatment of the patients in the reported study did not use the 3- point fixation proposed by Prasher et al<sup>4</sup>, Cassini et al<sup>7</sup> In the present study as far as the stability is concerned, two point fixation was more stable compared to the one point fixation at the zygomatic buttress similar to the study by Chakranarayan.<sup>3</sup> But it was seen that when the fracture was not comminuted, the one point fixation at zygomaticomaxillary buttress was stable as it is shown by the studies of Dakiret al<sup>8</sup>, Tarabhichi et al<sup>9</sup>, Hwang et al<sup>10</sup>. Fixation at zygomaticomaxillary buttress results in no scar, no palpability of the implant, shorter operating time. Manson et al<sup>11</sup>. reported that the zygomatic buttress can be effectively used for aligning the fractured fragments. In the present study in the Group 2 patients, stability achieved was excellent with two point fixation but scar at the FZ region was the main complaint of the patients jo et al<sup>5</sup>. Even postoperative swelling was more in Group 2 patients because of severed muscle and soft tissue in FZ region. Two point fixation required more time than one point fixation also it proved to be costly as compared to one point fixation. Also the patients complained of palpability of the plates at the FZ region Chakranarayan et al<sup>3</sup>. As far as stability is concerned two point fixation has the upper hand<sup>12-14</sup>

#### V. Summary And Conclusion

In this retrospective study, it is seen that in terms of stability, it is definitely two-point fixation which is superior. However it had its own disadvantages of more cost, longer operating time, implant palpability and un-aesthetic scars. But the fixation at the ZM buttress was quicker, cost effective, without scars, without implant palpability but fixation was inadequate in case of extensively comminuted fractures. Concerning detailed pre-operative and post-operative observations, we conclude that one point fixation at zygomatic buttress is a good option for poor patients and in the public sector where the resources are limited and the demand is high.

#### CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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