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ISOLATED ZYGOMATICO-ORBITAL INJURIES (IZOIs) IN TEHRAN: AN ANALYSIS OF 375 CASES

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ABSTRACT

Zygomatico-orbital injuries (ZOIs) are the most common injuries treated by the oral and maxillofacial surgeons. A respective analysis of 375 pateints with IZOIs treated in Najmeia and Baqiet-Ullah University Hospitals during a six-year period from 1984 to 1990 is presented. Male cases accounted for 94.4% (354); 59.46% (223) of the fractures involved the zygomatic bone, 70.13% (259) were fractures due to gunshot injuries, and 29.33% (110) were due to motor vehicle accidents (MVA). The etiology, pattern, and incidence of the injuries, as well as age, sex, presence of infection, time of treatments, and the results are discussed.
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INTRODUCTION

Zygomatico-orbital injuries are the most common midface injury.[2,4,6-9] The zygomatic bone forms the prominence of the cheek, contributing as well to the lateral and infraorbital margin, the lateral orbital wall, and part of the zygomatic arch. Najmeia and Baqiet-Ullah University Hospitals in Tehran province provide maxillofacial services for about one fifth of Tehran province, which has a population of about ten million. This study analyzes the data pertaining to patients who sustained zygomatico-orbital injuries from 1984 to 1990. This manuscript reports our experience in the treatment of IZOIs.

MATERIALS AND METHODS

Three hundred seventy-five patients suffering from IZOIs were treated in Najmeia and Baqiet-Ullah University Hospitals in Tehran between March 1, 1984 and Feb. 29, 1990. These cases were isolated from 1608 cases treated in these hospitals.

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Table I. Distribution of the ZOIs in Three Types

Type of Injury	Sex M	Sex F	Total	%
Soft tissue	13	2	15	4
Bony fractures	123	15	138	36.8
Mixed injury	212	4	216	57.6
Total	354	21	375	100

Table II. Relation Between Sex and Age in 375 Cases

Age	SEX M	%	F	%	Total	%
0-9	5	1.32			5	1.33
10-19	14	3.73	2	0.53	16	4.26
20-29	281	74.93	3	0.80	284	75.73
30-39	40	10.66	14	3.73	54	14.39
40-49	8	2.13	2	0.53	10	2.66
50-59	6	1.61			6	1.61

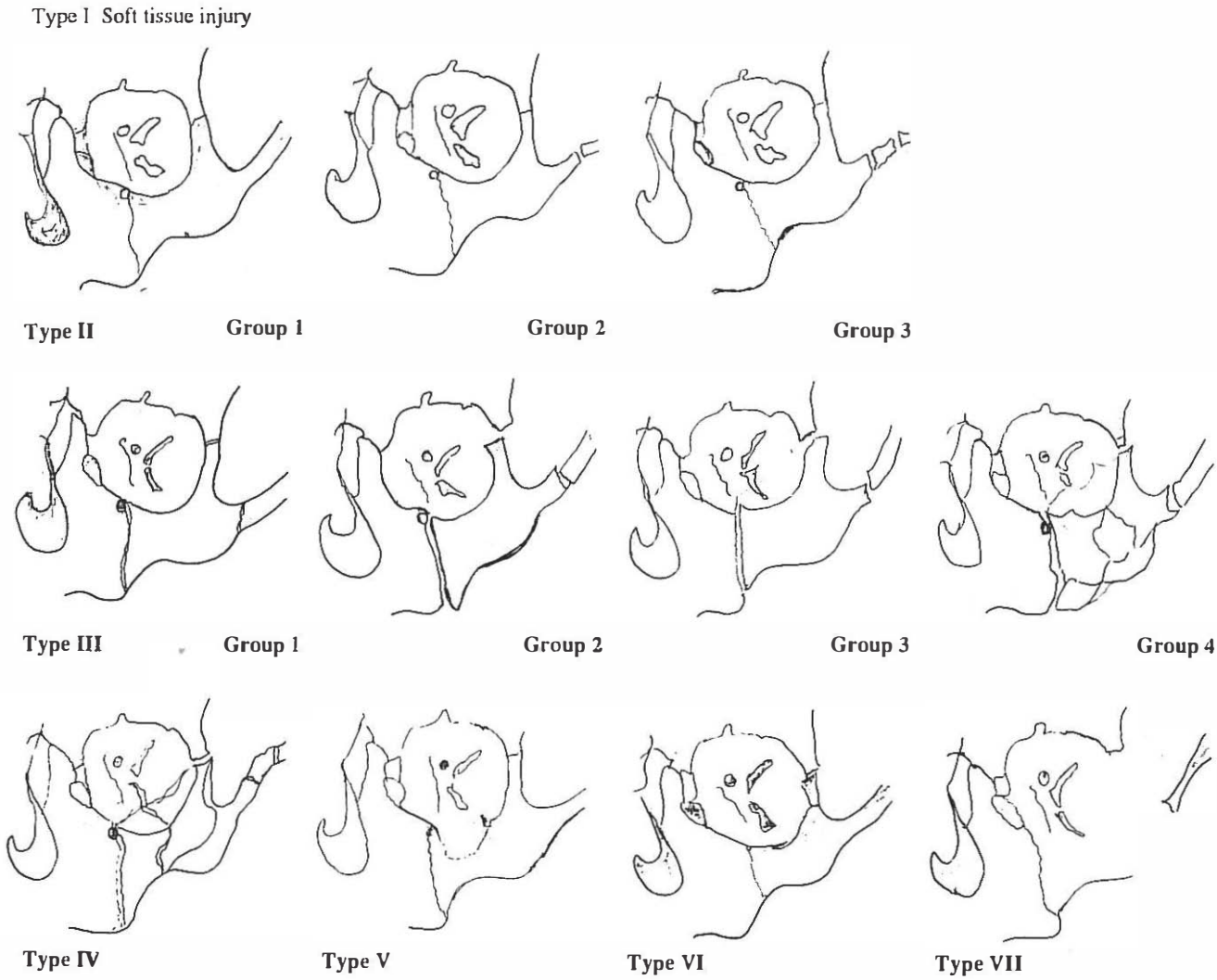

Fig. 1. Classification of ZO fractures.

Information in Fig. 5 was obtained from medical files and radiographs. When records were inadequate in the description of injury and radiographs were not available, the case was excluded from the study. IZOIs were classified as follows:

I. Soft- tissue injury,

II. Bony fractures,

III. Mixed injuries (bone and soft tissues).

Soft tissue injuries were classified into:

a. Laceration of the skin of the ZO area, if the area was greater than 2 cm in length.

b. Nerve injury, if it resulted in loss of motor function and/or sensation of the area

c. Ocular injury

Where bony fractures were involved, they were classified as zygomatic bone fracture, zygomatic arch fractures, pure blowout and orbital rim fractures. Data of these injuries are recorded in tabular form and expressed as percentages (Table I).

Age and Sex Distribution: Patients with IZOIs ranged in age from a 7-year old boy who was involved in a motorcycle accident, to a 55-year old man who had sustained zygomatic arch fractures in an industrial accident. The majority of the patients were male between the ages of nine and 55 years (94.4%, n= 354). Females were less commonly involved (5.6%, n= 21). Male to female ratio was 16.85: 1. The peak incidence of the males was in the 20-29 year age group, while the peak incidence in females was in the 30-39 year age group (Table II). The injuries have increased with each passing year during war times (Table III).

Etiology of IZOIs: The major causes of ZOIs in this study were recorded as follows:

1. Gunshot injuries, 259 cases;
2. MVA, 103 cases;
3. Interpersonal violence, 10 cases;
4. Industrial accidents, 4 cases;
5. Sports accidents, 2 cases; (see Table IV)

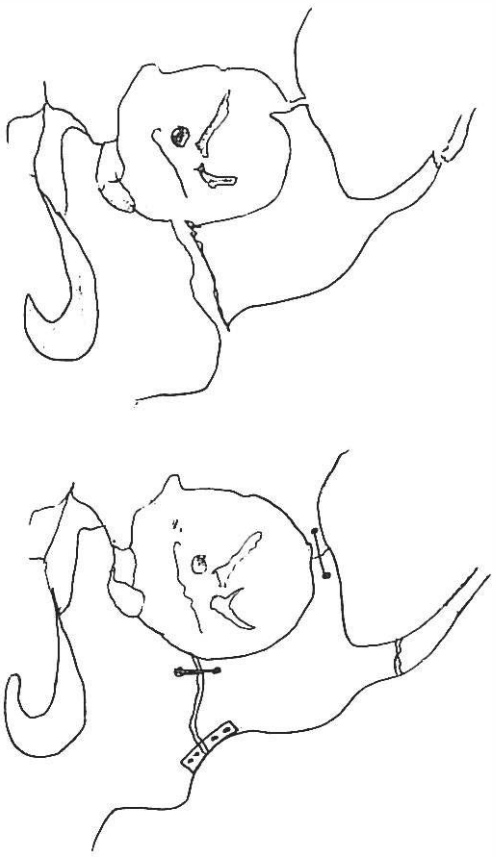

Fig. 2. Three point fixation.

Classification of IZOIs: we have classified the IZO injuries into the following categories:

Type I. Soft tissue injuries, 5.47% (n=20)

Type II. Zygomatic arch fracture only, 24.10% (n=88)

This type is divided into three groups:

Group 1. Nondisplaced or minimally displaced fractures, 46.59% (n=41)

Group 2. V-type fractures, 27.27% (n=24)

Group 3. Comminuted arch fractures, 26.14% (n=23)

Type III. Zygomatic bone fractures, 50.66% (n=190)

This type is divided into four groups

Group 1. Nondisplaced or minimally displaced fractures, 10.52% (n=20)

Group 2. Medial rotation of the frontal process of the zygomatic bone, 27.33% (n=52)

Group 3. Lateral rotation of the frontal process of the zygomatic bone, 16.84% (n=32)

Group4. Compound comminuted fractures of the zygomatic bone, 45.26% (n=86)

Type IV. Compound comminuted fractures of the zygomatic bone and arch, 8% (n=30)

Type V. Pure blowout fractures, 6.13% (n=23)

Type VI. Infraorbital rim fractures, 2.4% (n=9)

(See Fig. 1, and Table IV).

Associated Non-facial Injuries: There were 323 cases with associated injury, which involved injury to the head, eye, thorax, abdomen, etc. Most of these cases were eye

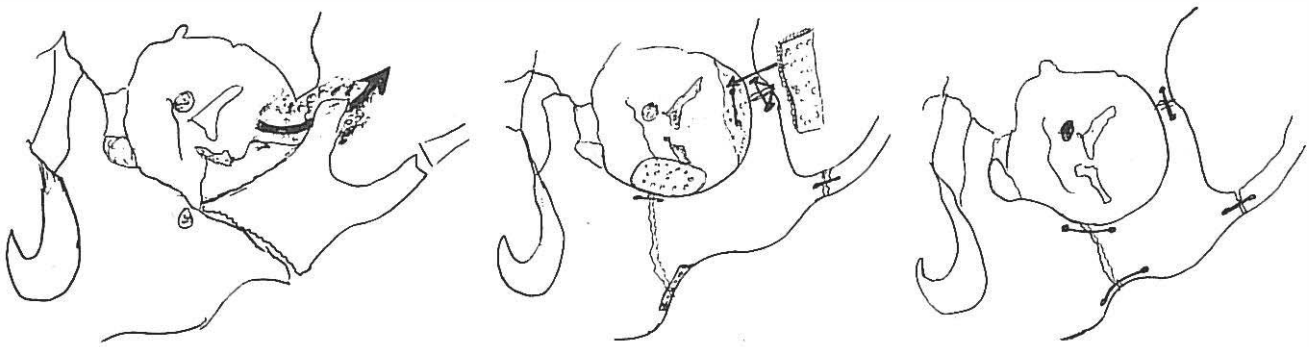

Fig. 3. Four point fixation with defect reconstruction

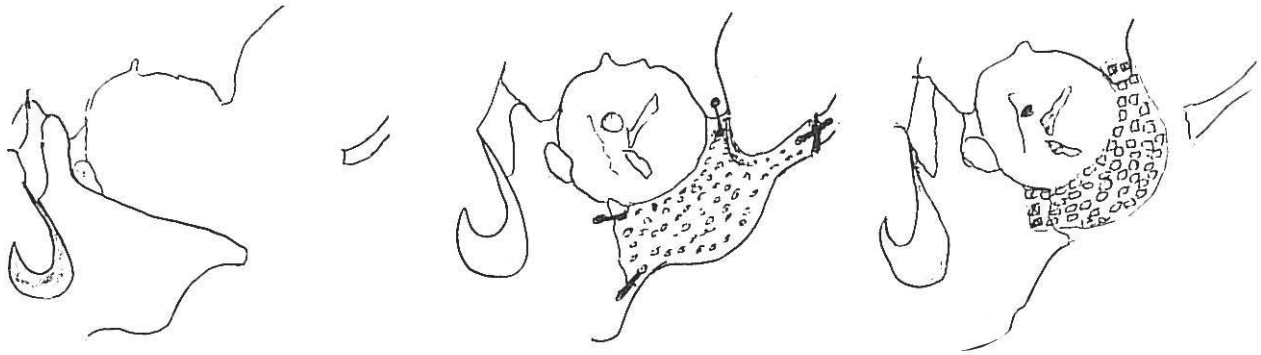

Fig. 4. Defect reconstruction by titanium mesh and bone or by bone cement.

Table III. Month and Yealy Distribution of IZOIs

Month	1984	1985	1986	1987	1988	1989	1990	Total	%
Jan.		12	13	19	10	4	2	60	16
Feb.		3	2	3	10	3	2	23	6.13
Mar.	3	3	2	3	2	4	-	17	4.53
Apr.	1	4	2	5	4	3	-	19	5.06
May.	1	3	3	8	6	3	-	24	6.40
Jun.	3	3	8	8	4	3	-	29	7.73
Jul.	1	2	5	6	4	6	-	24	6.40
Aug.	3	5	7	4	6	4	-	29	7.73
Sep.	1	3	5	4	2	4	-	19	5.06
Oct.	2	8	8	10	5	4	-	37	9.86
Nov.	3	5	7	9	2	3	-	29	7.73
Dec.	5	10	19	18	7	6	-	65	17.33
Total	23	61	81	95	52	47	4	375	100

injuries, followed by head injury, and multiple injuries. The eye injuries ranged from subconjunctival hemorrhage to eye enucleation.

Treatment: To avoid danger of consolidation in malposition of the fractures, we attempted treament as early as possible, as opposed to Fries, 1977, who recommended treatment after the edema has subsided. In mixed injuries, soft tissue repair was undertaken first, then bony fixation or reconstruction was done after a time. The time between soft tissue repair and bone fixation ranged from two to 12 weeks, depending on the severity of the injury, general condition of the patient and the presence of an associated injury. The clinical and radiographic follow-up period ranged from three weeks to three years postoperatively.

Our clinic was responsible for three types of injuries:

1. Emergency cases,
2. Referred cases from other hospitals in Tehran province,
3. Referred cases from outside Tehran province.

Patients presenting for treatment within 24 hours of injury were 22.93% (n= 86), within 48 hours of injury 40% (n= 150), and within three days of injury 31.46% (n= 118). Cases presenting after three days (3-10 dyas) comprised 2.66% (n= 10), and 2.4% (n= 9) presented after 10 days.

Preoperative infection was present in 29.12% (n= 109) of all cases, most of them due to gunshot injury. Approximately 29% of the cases were treated by repositioning the fracture using a bone hook. While 11.46% (n= 43) were treated by Gillies method, 44.8% (n= 168) were treated by different techniques of open reduction, with or without defect reconstructions (Figs. 2-5). Forty-one patients from our sample did not require any surgery. Many complications were recorded preoperatively or postoperatively in our patients. Preoperative complications ranged from sensory nerve injury to the loss of vision, 78.66% (n= 295). Infraorbital scar was the most common complication postoperatively, 9.33% (n= 35). (See Tables V, VI, and VII).

Table IV.Types of ZO Fractures and Their Causative Factors

Abbreviation Key:
B-Bullet
M-Missile
BB-Bomb blast
S-Sport accident
TT-Total for that category
O-Other
IA-Interpersonal alteration
IN- Industry
TI-Total for that subgroup

Type of Fracture	SEX	B	M	BB	O	MCA	MVA Car	●	IA	IN	S	TI	TT
Type I	M	10	1	1	1	3	1	-	-	-	-	-	17
	F	1	1	-	-	2	-	-	-	-	-	-	4
Type II	M	-	-	-	-	-	-	-	-	-	-	-	82
	F	-	-	-	-	-	-	-	-	-	-	-	6
Group 1	M	23	6	4	1	5	1	-	1	-	-	41	-
	F	-	-	-	-	-	-	-	-	-	-	-	-
Group 2	M	-	4	-	2	9	-	-	2	1	1	19	-
	F	-	-	-	-	2	2	1	-	-	-	5	-
Group 3	M	-	4	-	5	11	-	1	1	-	-	22	-
	F	-	-	-	-	-	1	-	-	-	-	1	-
Type III	M	-	-	-	-	-	-	-	-	-	-	-	182
	F	-	-	-	-	-	-	-	-	-	-	-	8
Group 1	M	2	3	3	5	3	1	2	-	-	17	-	
	F	2	-	-	-	-	1	-	-	-	3	-	
Group 2	M	36	3	2	9	-	-	-	-	-	50	-	
	F	1	-	-	-	1	-	-	-	-	2	-	
Group 3	M	10	-	7	2	8	2	1	2	-	-	30	-
	F	2	-	-	-	-	-	-	-	-	-	2	-
Group 4	M	47	24	7	-	-	5	2	-	-	-	85	-
	F	-	-	-	-	-	1	-	-	-	-	1	-
Type IV	M	13	3	7	-	-	2	3	-	-	-	-	28
	F	-		-	-	-	1	-	1	-	-	-	2
Type V	M	7	7	5	-	-	3	-	-	-	-	-	22
	F	-	-	-	-	-	-	-	1	-	-	-	1
Type VI	M	3	4	3	-	-	3	-	-	2	-	-	15
	F	-	-	-	-	-	-	-	-	-	-	-	-
Type VII	M	-	1	1	-	-	5	-	-	1	1	-	9
	F	-	-	-	-	-	-	-	-	-	-	-	-
Total	M	147	53	41	15	50	25	8	8	4	2	-	354
	F	6	1	-	-	5	6	2	2	-	-	-	21
		153	54	41	15	55	31	10	10	4	2	-	375
Total %		40.8	14.4	10.93	4.14	14.66	8.0	2.66	2.66	1.06	0.53		100

Fig. 5. Examples of ZOIs and their treatment.

Table V. Types of Treatments Used in ZOIs

Treatment	No.	%
1. Soft tissue repair	20	5.33
2. Repositioning of the fracture by using bone hooks	93	24.8
3. Gillies Method	43	11.46
4. Open reduction used		
a. 2-point fixation	5	1.33
b. 2-point fixation with antral pack	15	4
c. 2-point fixation with orbital floor reconstructions	10	2.66
d. 3-point fixation w/without defect reconstruction	50	13.33
e. 4-point fixation w/without defect reconstruction	39	10.4
5. Total ZO reconstruction, using bone graft, titanium mesh, or bone cement	59	15.73
Total	334	89.06

*In mixed injuries, the soft tissue repairs are not accounted for

Table VI. Preoperative Complications

	No.	%
Infection	23	6.13
Facial assymetry	12	3.46
Facial nerve injury	13	4.46
Ocular injury	5	1.33
Soft tissue & sensory nerve defects	28	7.46
More than one injury	295	78.66
Total	375	100.00

Table VII. Postoperative Complications

	No.	%
Infection	9	2.4
Limitation of mouth opening	15	4.0
Residual deformity in the ZO Region	25	6.66
Infraorbital Scar	35	9.33
Total	84	22.40

DISCUSSION

The zygomatico-orbital region comprises a complex anatomical arrangement of hard and soft tissues, which contains numerous nerves, blood vessels, and other important structures. Injuries in this area may involve any number of structures, especially with gunshot injuries. In the present report, it is significant that gunshot injuries was the first causative factor, 78.66% (n= 259) involving simple or multiple injuries in the ZO region. Other reports state that MVA were the first causative factors.[4,6,8] The severity of the gunshot injury depends on the caliber, mass, and velocity of the bullet.[5,8] Our report shows that males were involved in a higher percentage of injuries than females; this is in agreement with other reports. In the treatment, we have tried to use the simplest techniques to reduce the complications of surgery. In zygomatic complex or comminuted fractures, we used three or four fixation points to prevent the displacement of the fragments. In the buttress of the zygoma, we have used miniplates more often than wires. In orbital floor defects, if the fragments were attached, we used antral pack to support the fragment, after rim fixation by wire or miniplate. In groups 4 and 5 (listed above), we used bitemporal coronal incision for ZO reconstructions. Infraorbital incision for orbital floor exploration was the most common approach.[1] Post-operative infraorbital edema was recorded in some cases and subsided within 8-14 dyas. Postoperative steroids, such as dexamethasone were routinely used in our patients because it is a well-recognized anti-inflammatory drug.[3]

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