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Clinical Analysis of Midfacial Fractures

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ABSTRACT

Purpose: To analyze the features of midfacial fractures. **Methods:** Data of 320 patients treated for midfacial fractures during the past 10 years were retrospectively analyzed. **Results:** Patients were 192 male and 128 female. Their age ranged from 1 to 96 years old with the average of 42.1. Injury most frequently occurred by traffic accidents in 168 patients, followed by falls in 78, assaults in 31 and sports in 25. Pattern of the fractures was classified into zygoma in 159 patients, alveolus in 60, multiple sites in 54, maxilla in 45 and nasal bone in 2. Facial injury severity scale ranged from 1 to 12 with the average of 1.52. Injuries to other sites of the body were found in 90 patients. Fractures of multiple sites showed higher facial injury severity scale and were associated with injuries to other sites of the body at a higher rate. Observation was most frequently chosen in 153 patients, followed by open reduction and internal fixation in 72, intramaxillary fixation in 43 and transcutaneous reduction in 26. **Conclusions:** Midfacial fractures showed a variety of features in terms of the site and severity and associated injuries. Understanding these features is important to manage these patients properly.

Key words: Fracture, Midface, Zygoma, Maxilla, Facial injury severity scale.

1. INTRODUCTION

Maxillofacial fractures can have various causes, such as traffic accidents, falls, assaults, sports and others, in isolation or in combination with other injuries (1-12). Management of these fractures is a challenge for oral and maxillofacial surgeons, demanding a high level of expertise (2, 8, 11). Maxillofacial fractures are primarily treated to restore the function and esthetics according to the site and severity of the fractures in consideration of other injuries and the general condition of the patient. However, there are anatomical and functional differences between the midface and the mandible that greatly affect the consequence of the injuries.

The midface is anatomically complicated and closely associated with several important functions. Fractures in the midface may cause deformity of the midface, sensory disturbance, malocclusion, impairment of mandibular movement, and ocular dysfunction depending on the site and severity. In addition, midfacial fractures are sometimes associated with severe cranial injuries (13), which often need to be primarily treated, even though the treatment of midfacial fractures is delayed or limited. Therefore, the management of midfacial fractures requires a high level of expertise based on clinical evidence and also collaboration with other departments.

A number of reports have been published from several countries in which the features of maxillofacial fractures were analyzed focusing on specific areas of interest (1-13). An understanding of the cause, site, severity and the associated injuries of maxillofacial fractures greatly helps to develop more effective management; however, only a few studies in a relatively large number of patients have focused on midfacial fractures (14-20).

In the present study, therefore, we retrospectively analyzed midfacial fractures in terms of the etiology, site and severity of the injuries and treatment modalities to obtain information for better understanding of these fractures.

2. SUBJECTS AND METHODS

Three hundred twenty patients seeking treatment for midfacial fractures at the Department of Oral and Maxillofacial Surgery, Nara Medical University, Japan, during the 10 years between April 2002 and March 2012 were the subjects of the present study. Data on these patients were obtained from their clinical records and radiographs, and were retrospectively analyzed for demographics, cause of injury, the site and severity of the fractures, injuries to other sites of the body and treatment modality. Pattern of the fractures were classified into 5 groups as follows, 1) nasal bone: nasal bone fracture only, 2) alveolus: alveolar bone fracture only or with nasal bone fracture, 3) zygoma: unilateral fracture of the zygoma (zygomatico-maxillary complex) only or with nasal bone fracture and/or alveolar bone fracture, 4) maxilla: maxillary wall fracture and/or Le Fort Type I fracture and/or sagittal fracture of the maxilla, or with nasal bone fracture and/or alveolar bone fracture, 5) multiple sites: bilateral fractures of the zygoma, Le Fort Type II or III fracture, naso-orbital ethmoid fractures, or other multiple or comminuted fractures of the midface. The severity of maxillofacial fractures was evaluated according to the facial injury severity scale (FISS) proposed by Bagheri et al (21) with modification by Erdmann et al (8). Statistical analysis was performed using

Mann-Whitney's U-test and the chi-square test. The study protocol was approved by the institutional review board and in accordance with the principles of the Declaration of Helsinki.

3. RESULTS

The patients were 192 male and 128 female. Their age ranged from 1 to 96 years old with the average of 42.1 years old (Table 1). The 320 patients accounted for approximately 52.6% of all maxillofacial fracture patients during the same period. Injuries occurred at a slightly higher rate on Sunday in 56 patients (17.5%) and on Saturday in 52 (16.3%) in terms of the day of the week, and in April in 35 patients (10.9%) and in March and September in 31 each (9.7%, each) in terms of the month. Injuries occurred frequently between 15:00 to 21:00 in 101 of 284 patients (35.6%) in whom the time of the accident was recorded.

Age	Number of patients (%)[1)]	Gender	
		Male	Female
~9	14 (4.4)	7	7
10–19	54 (16.9)	37	17
20–29	53 (16.6)	38	15
30–39	36 (11.3)	22	14
40–49	39 (12.2)	21	18
50–59	42 (13.1)	25	17
60–69	33 (10.3)	15	18
70–79	30 (9.4)	16	14
80~	19 (5.9)	11	8
Total	320 (100.0)	192 (60.0)	128 (40.0)

Table 1. Age and gender of the patients. 1) Percentage of total number of patients

Two hundred ninety-one patients (90.9%) were referred from other clinics or hospitals. The departments from which the patients had been referred were identified in 274 patients as follows, from Emergency in 101 patients (36.9%), Neurosurgery in 35 (12.8%), Surgery in 31 (11.3%), Otolaryngology in 30 (10.9%), Orthopedics in 25 (9.1%), Dentistry in 24 (8.8%), and others in 28 (10.2%). Two hundred and forty patients (75.0%) visited our department within 3 days after the injury.

The cause of the midfacial fractures is shown according to the gender and the age of the patients (Table 2). One hundred and sixty-eight patients (52.5%) were injured in a traffic accident, followed by fall in 78 (24.4%), assault in 31 (9.7%), sports in 25 (7.8%), work-related accident in 13 (4.1%), striking an object in 4 (1.3%) and unknown in 1 (0.3%). In traffic accidents, 71 patients were on a motorcycle, 47 were on a bicycle, 34 were in an automobile, 13 were pedestrians and 3 were in other vehicles. Fall occurred on a level surface in 51 patients (simple fall) and from a height in 27 (fall from height). Twenty-four of 25 patients (96.0%) injured in sports and all patients (100.0%) injured in work-related accidents were male. Thirty-four of 51 patients (66.7%) suffering a simple fall were female and 17 of 27 patients (63.0%) in falls from a height were male. Patients injured in sports were young, with an average of 25.5 years old, as were those injured in assaults, with an average of 34.4 years old. Patients injured in traffic accidents as pedestrians were older, with an average of 61.9 years old, as were those injured in a simple fall, with an average of 56.6 years old.

Cause of the injuries	Number of patients (%)[1)]	Gender		Age (years old)	
		Male	Female	Range	Mean ± SD
Traffic accidents	168 (52.5)	96	72	3 - 91	41.4 ± 20.8
Automobile	34	17	17	3 - 81	37.9 ± 18.4[2)]
Motorcycle	71	45	26	16 - 91	37.7 ± 20.4[3)]
Bicycle	47	23	24	5 - 87	44.3 ± 19.8[4)]
Pedestrian	13	8	5	5 - 84	61.9 ± 22.3[5)]
Others	3	3	0	25 - 51	34.7 ± 14.2
Falls	78 (24.4)	34	44	1 - 96	53.0 ± 25.2
Simple fall	51	17	34	5 - 93	56.6 ± 23.9[6)]
Fall from height	27	17	10	1 - 96	46.3 ± 26.5[7)]
Assault	31 (9.7)	23	8	14 - 77	34.4 ± 17.5[8)]
Sports	25(7.8)	24	1	13 - 70	25.5 ± 16.3[9)]
Work	13(4.1)	13	0	23 -75	44.3 ± 17.0[10)]
Striking an object	4(1.3)	1	3	5 - 42	18.8 ± 22.3[11)]
Unknown	1 (0.3)	1	0	35	35.0 ± 0.0
Total	320 (100.0)	192	128	1 - 96	42.1 ± 22.5

Table 2. Cause of the injuries according to gender and age of the patients. 1) Percentage of total number of patients, 2) Significantly different from pedestrian (p=0.0010), simple fall (p=0.0003) and sports (p=0.0002), 3) Significantly different from bicycle (p=0.0498), pedestrian (p=0.0008), simple fall (p<0.0001), sports (p=0.0004) and striking an object (p=00359), 4) Significantly different from motorcycle (p=0.0498), pedestrian (p=0.0064), simple fall (p=0.0043), assault (p=0.0184), sports (p<0.0001) and striking an object (p=0.0440), 5) Significantly different from automobile (p=0.0010), motorcycle (p=0.0008), bicycle (p=0.0064), assault (p=0.0004), sports (p=0.0002), work (p=0.0196) and striking an object (p=00235), 6) Significantly different from automobile (p=0.0003), motorcycle (p<0.0001), bicycle (p=0.0043), assault (p<0.0001), sports (p<0.000 1) and striking an object (p=00165), 7) Significantly different from sports (p=0.0031), 8) Significantly different from bicycle (p=0.0184), pedestrian (p=0.0004), simple fall (p<0.0001) and sports (p=0.0189), 9) Significantly different from automobile (p=0.0002), motorcycle (p=0.0004), bicycle (p<0.0001), pedestrian (p=0.0002), simple fall (p<0.0001), fall from height (p=0.0031), assault (p=0.0004) and work (p=0.0008), 10) Significantly different from pedestrian (p=0.0196), sports (p<0.000 8) and collision (p=00476), 11) Significantly different from motorcycle (p=0.0359), bicycle (p=0.0440), pedestrian (p=0.0235), simple fall (p=0.0165) and work (p=0.0476)

Pattern of the midfacial fractures are shown in terms of the cause in Table 3. Fractures of the zygoma were commonly found in 159 patients (49.7%), followed by those of the alveolus in 60 (18.8%), the multiple sites in 54 (16.9%) and the maxilla in 45 (14.1%). Fractures of the nasal bone were observed in only 2 patients (0.6%). Fractures of the zygoma occurred most frequently in all causes except for work-related accidents. Fractures of the multiple sites occurred at a higher rate in work-related accidents, a fall from a height and traffic accidents as a pedestrian, but not in sports at all. Fractures of the alveolus were common in sports, fall from a height and a simple fall.

Severity of the midfacial fractures was evaluated by FISS (Table 4). FISS ranged from 1 to 12 with the average of 1.52 ± 1.40. Most injuries were not so severe. FISS was 1 in 253 patients (79.1%) and 2 in 33 (10.3%). In terms of the causes of the injuries, FISS was the highest in work-related accidents at 2.39, followed by automobile accidents at 2.12 and fall from a height at 1.82

Cause of the injuries	Number of patients (%)[1]	Pattern of the fractures (%)[1]				
		Nasal bone	Alveolus	Zygoma	Maxilla	Multiple sites
Traffic accidents	168 (52.5)	0	25	87	25	21
Automobile	34	0	6	14	7	7
Motorcycle	71	0	10	44	5	12
Bicycle	47	0	9	20	10	8
Pedestrian	13	0	0	8	2	3
Others	3	0	0	1	1	1
Falls	78 (24.4)	1	21	36	7	13
Simple fall	51	1	13	26	5	6
Fall from height	27	0	8	10	2	7
Assault	31 (9.7)	1	2	16	8	4
Sports	25(7.8)	0	9	14	2	0
Work	13(4.1)	0	2	2	3	6
Striking an object	4(1.3)	0	1	3	0	0
Unknown	1 (0.3)	0	0	1	0	0
Total	320 (100.0)	2 (0.6)	60 (18.8)	159 (49.7)	45(14.1)	54 (16.9)

Table 3. Cause and pattern of the fractures. 1) Percentage of total number of patients

Cause of the injuries	Number of patients	Facial injury severity scale		Fractures of the mandible (%)[2]	Injuries to other sites of the body[1] (%)[2]
		Range	Mean ± SD		
Traffic accidents	168	1-12	1.67 ± 1.60	33 (19.6)	66 (39.3)
Automobile	34	1-12	2.12 ± 2.47	8 (23.5)	20 (58.8)[3]
Motorcycle	71	1-7	1.62 ± 1.48	12 (16.9)	26 (36.6)[4]
Bicycle	47	1-6	1.43 ± 0.95	8 (17.0)	9 (19.1)
Pedestrian	13	1-5	1.70 ± 1.14	4 (30.8)	10 (76.9)[5]
Others	3	1-3	1.67 ± 1.16	1 (33.3)	1 (33.3)
Falls	78	1-8	1.37 ± 1.14	11 (14.1)	16 (20.5)
Simple fall	51	1-3	1.14 ± 0.41	5 (9.8)	7 (13.7)
Fall from height	27	1-8	1.82 ± 1.80	6 (22.2)	9 (33.3)[6]
Assault	31	1-3	1.23 ± 0.50	3 (9.7)	2 (6.5)
Sports	25	1-1	1.00 ± 0.00	1 (4.0)	1 (4.0)
Work	13	1-9	2.39 ± 2.29	5 (38.5)[7]	5 (38.5)[8]
Striking an object	4	1-1	1.00 ± 0.00	0 (0)	0 (0)
Unknown	1	1-1	1.00 ± 0.00	0 (0)	0 (0)
Total	320	1-12	1.52 ± 1.40	53 (16.6)	90 (28.1)

Table 4. Cause and severity of the injuries . 1) Head/brain: 43, chest/clavicle/rib: 26, forearm 16, fibula/tibia: 16, femur: 15, spine: 8, hand: 7, internal organ: 7, arm: 4, pelvis: 4, foot: 4, knee: 3, and others: 7 (includes multiple sites), 2) Percentage of number of patients in each cause, 3) Significantly different from motorcycle (p=0.0319), bicycle (p=0.0002), simple fall (p<0.0001), fall from height (p=0.0477), assault (p<0.0001) and sports (p<0.0001), 4) Significantly different from bicycle (p=0.0420), simple fall (p=0.0050), assault (p=0.0017) and sports (p=0.0018), 5) Significantly different from motorcycle (p=0.0069), bicycle (p=0.0003), simple fall (p<0.0001), fall from height (p=0.0097), assault (p<0.0001), sports (p<0.0001) and work (p=0.0472), 6) Significantly different from simple fall (p=0.0413), assault (p=0.0092) and sports (p=0.0198), 7) Significantly different from simple fall (p=0.0346) and sports (p=0.0217), 8) Significantly different from assault (p=0.0280) and sports (p=0.0217)

(Table 4). FISS was the lowest in sports at 1.00, followed by a simple fall at 1,13 and assault at 1.23; however, the difference was not significant between any causes. Mandibular fractures were associated in 53 patients (16.6%). These were more common in work-related accidents (5 of 13 patients, 38.5%) and traffic accident as a pedestrian (4 of 13 patients, 30.8%). In terms of the pattern of the fractures, FISS was 1 in fractures of the nasal bone, alveolus, and zygoma, since all of these fractures were isolated without fractures at either of these sites (Table 5). FISS was mostly 1 in fractures of the maxilla and was the highest at 4 in a patient with bilateral Le Fort Type I fractures in combination with sagittal and alveolar fractures. FISS of fractures of the multiple sites ranged from 2 to 12 according to the involved sites. Mandibular fractures were associated at a higher rate in fractures of the multiple sites (16 of 54 patients, 29.6%) and also in fractures of the alveolus (12 of 60 patients, 20.0%).

Injuries to other sites of the body occurred in 90 patients (28.1%). These injuries were frequently observed in traffic accidents as a pedestrian (10 of 13 patients, 76.9%), in an automobile (20 of 34 patients, 58.8%) and on a motorcycle (26 of 71 patients, 36.6%), and also in work-related accidents (5 of 13 patients, 38.5%) and in falls from a height (9 of 27 patients, 33.3%) in terms of the cause (Table 4), and in fractures of the multiple sites (29 of 54 patients, 53.7%) in terms of the pattern of the midface fractures (Table 5). Injuries were commonly observed to the head/brain in 43 patients followed by chest/clavicle/rib in 26, forearm and fibula/tibia in 16 each, and femur in 15.

Treatment for the midfacial fractures is shown in Table 6. Observation was most frequently chosen in 153 patients (47.8%), followed by open reduction and internal fixation (ORIF) in 72 (22.5%), intramaxillary fixation (IMF) in 43 (13.4%) and transcutaneous reduction (TCR) in 26 (8.1%). Forty-one of 60 fractures of the alveolus (68.3%) were treated by IMF. IMF was performed using an arch bar in most cases and a thermoforming splint in a few cases. Thirty-six of 159 fractures of the zygoma (22.6%) were treated by ORIF and 23 (14.5%) by TCR, but 97 (61.0%) were followed by observation. TCR was performed primarily in isolated zygomatic arch fractures with displacement under local anesthesia. Twenty-nine of 45 fractures of the maxilla (64.6%) were followed by observation and 8 (17.7%) were treated by ORIF. Twenty-eight of 54 fractures of the multiple sites (51.9%) were treated by ORIF, but 20 (37.0%) were followed by observation. Orbital floor reconstruction by plate or support by balloon through the maxillary sinus was necessary in a few cases. MMF was used only 2 patients with fractures of the maxilla. Two fractures of nasal bone were referred to Otolaryngology. In terms of the severity, FISS was higher in patients treated by ORIF of 2,47 and by MMF of 3.00, both of which were significantly higher than those treated by other modalities.

Pattern of fracture	Number of patients	Facial injury severity scale		Fracture of the mandible (%)[1]	Injuries to other sites of the body (%)[1]
		Range	Mean SD		
Nasal bone	2	1-1	1.00 ± 0.00	0 (0.0)	0 (0.0)
Alveolus	60	1-1	1.00 ± 0.00	12 (20.0)[2]	10 (16.7)
Zygoma	159	1-1	1.00 ± 0.00	16 (10.1)	38 (23.9)
Maxilla	45	1-4	1.36 ± 0.65	9 (20.0)	13 (28.9)
Multiple sites	54	2-12	3.80 ±2.24[3]	16 (29.6)[4]	29 (53.7)[5]
Total	320	1-12	1.52 ± 1.40	53 (16.6)	90 (28.1)

Table 5. Pattern of the fracture and severity of the injuries. Percentage of number of patients in each site. 1) Significantly different from zygoma (p=0.0495), 2) Significantly different from maxilla (p<0.0001), 3) Significantly different from zygoma (p=0.0005), 4) Significantly different from alveolus (p=0.0006) and zygoma (p=0.0016)

Treatment	Number of patients (%)[1)]	Pattern of the fractures					Facial injury severity scale		Injuries to other sites of the body (%)[2)]
		NB	ALV	ZYG	MX	MLP	Range	Mean± SD	
ORIF	72(22.5)	0	0	36	8	28	1-12	2.47± 2.28[3)]	29 (40.3)[4)]
MMF	4(1.3)	0	0	0	2	2	1-6	3.00± 2.10[5)]	2 (50.0)
IMF	43(13.4)	0	41	0	2	0	1-4	1.07± 0.46	5 (11.6)
TCR	26(8.1)	0	0	23	0	3	1-2	1.12± 0.33	5 (19.2)
Others	16(5.0)	0	12	1	3	0	1-2	1.13± 0.34	5 (31.3)
OBS	153(47.3)	0	7	97	29	20	1-9	1.28± 0.92	43 (28.1)[6)]
Unknown	6(1.9)	2	0	2	1	1	1-3	1.50± 0.84	1 (16.7)
Total	320(100.0)	2	60	159	45	54	1-12	1.52± 1.40	90 (28.1)

Table 6. Treatment according to site and severity of the injuries. NB: nasal bone, ALV: alveolus, ZYG: zygoma, MX: maxilla, MLP: multiple sites, ORIF: open reduction and internal fixation, MMF: maxillomandibuar fixation, IMF: intramaxillary fixation, TCR: transcutaneous reduction, OBS: observation, 1) Percentage of total number of patients, 2) Percentage of number of patients in each treatment, 3) Significantly different from intramaxillary fixation (p<0.0001), transcutaneous reduction (p=0.0037), others (p=0.0190) and observation (p<0.0001), 4) Significantly different from intramaxillary fixation (p=0.0180), transcutaneous reduction (p=0.0286), others (p=0.0393) and observation (p=0.0287), 5) Significantly different from intramaxillary fixation (p=0.0011), 6) Significantly different from intramaxillary fixation (p=0.0264)

Injuries to other sites of the body were observed at a higher rate in the patients treated by ORIF (29 of 72 patients, 40.3%) and also in those followed by observation (43 of 153 patients, 28.1%).

4. DISCUSSION

The anatomical structure of the midface is complicated and classification of the fractures was sometimes difficult. The Le Fort Type classification and Knight & North classification have been generally used for fractures of the midface; however, it is often difficult to classify midfacial fractures according to these classifications because of the complicated patterns of the fractures. Furthermore, these classifications are not always in parallel with the severity of the injuries. In the present study, therefore, midfacial fractures were classified into 5 patterns from our original point of view according to the main sites of the injuries, and were analyzed retrospectively.

More than half of all midfacial fractures occurred in traffic accidents, followed by falls. Injuries in traffic accidents as a pedestrian and simple falls were mostly observed in older patients. These findings indicate that older patients are likely to be injured in daily life activity, probably related to the physiologic consequences of aging and the presence of systemic pathologic conditions (22-24). Injuries in sports and assault were observed in younger patients. This is probably because young people are socially more active and often involved in various types of accident. These injuries were not so severe and were usually not associated with mandibular fractures or injuries to other sites of the body. Similarly, injuries in simple falls were not so severe, since these injuries occurred by a relatively simple and low velocity impact; however, injuries in traffic accidents, falls from a height and work-related accidents were often severe and associated with injuries to other sites of the body. Since these injuries are considered to occur by higher velocity forces, urgent treatment may be required; therefore, patients injured by these means should be carefully examined and processed for proper management (13, 25-27).

Isolated fractures of the zygoma were most frequently observed, consisting of about half of all fractures (159 patients, 49.7%). This is because the zygoma is a prominent bone structure in the midface and therefore susceptible to various types of impact (15, 19). Although nasal bone fractures are also considered common midfacial fractures (28, 29), only 2 isolated factures of the nasal bone were observed. This was probably because most patients with nasal bone fractures were treated in Otolaryngology and seldom consulted Oral and Maxillofacial Surgery. In reverse, fractures of the alveolus were relatively frequent, consisting of a fifth of the patients (60 patients, 20%) probably due to concerns regarding occlusal disturbance and preservation of the involved teeth. Fractures of the maxilla were not so frequent and were observed in 45 patients (14.1%), since only maxillary wall, Le Fort Type I and sagittal fractures were included in the category and Le Fort Type II or III fractures were classified into fractures of the multiple sites in the present study.

In terms of the severity, most of the midfacial fractures were not so severe, with the average FISS of 1.52. Two hundred fifty-three patients (79.1%) were classified into FISS 1. This was due to the inclusion of fractures of the nasal bone and the alveolus and the prevalence of unilateral fractures of the zygoma. Most of the fractures were treated within the department. In fractures involving the orbital wall, consultation with Ophthalmology was often made for evaluation of ocular function (30). Fractures of the multiple sites were observed in 54 patients (16.9%). These were more severe injuries with higher FISS ranging from 2 to 12 with the average of 3.80. Fractures involving multiple sites of the midface were sometimes complicated and/or comminuted and had lost the anatomical landmarks for reduction.

Injuries to other sites of the body were observed in 90 patients (28.1%). The rate was relatively higher than in the previous study (24). The rate of injuries to other sites of the body was significantly higher in patients injured in traffic accidents in an automobile (58.8%), on a motorcycle (36.6%) and as a pedestrian (76.9%), in work-related accidents (38.5%) and falls from a height (33.3%) in terms of the cause and in those with fractures of the multiple sites (53.7%) in terms of the pattern of the fractures. These patients sometimes needed to be primarily treated in other medical departments (27). Injuries were commonly observed to the head/brain, upper and lower extremities and chest/clavicle/rib, consistent with other studies (25-27). Although life-threatening injuries may be sometimes complicated in patients with midfacial fractures (13), no deaths were recorded in the present study. This is considered partly due to the underestimation of mortality rates in the study of Oral and Maxillofacial Surgery, as some patients with facial injuries may die at the scene or soon after arrival and never reach maxillofacial surgeons.

More than half of the midfacial fractures were followed without reduction and/or fixation. ORIF was performed in less than a fourth of the patients (72 patients, 22.5%). This result reflected the high rate of observation in fractures of the zygoma (97 of 159 patients, 61.0%) and the maxilla (29 of 45 patients, 64.4%).

In isolated zygomatic fractures, the necessity of reduction and/or fixation is dependent on the degree of displacement and impairment of function (31); however, the choice of treatment is not always determined by these factors. Some patients were reluctant to undergo surgery, since they were not so concerned about a slight facial deformity or hypoesthesia unless function was seriously impaired (22-24). In fractures of the maxilla, ORIF was also limited to cases of severe mobility of the bone fragment and/or dysfunction, such as occlusal disturbance. In fractures of the alveolus, IMF was chosen in 41 patients (68.3%) and others in 12 (20%). The high rate of intervention may reflect the need for correction of occlusal disturbance; however, these injuries are not so severe and can usually be treated under local anesthesia. In fractures of the multiple sites, more than half of the patients (28 of 54 patients, 51.6%) were treated by ORIF. Since fractures involving multiple sites of the midface are severe with higher FISS, aggressive treatments such as ORIF were required for such injuries.

The patients treated by ORIF not only showed significantly higher FISS but also were accompanied by injuries to other sites of the body at a higher rate (40.3%). These results reflect the severity of the injuries in such patients; however, the patients followed by observation also showed a relatively high rate of injuries to other sites of the body (28.1%). This was probably because maxillofacial fractures in patients with injuries to other sites of the body are more severe and need to be treated by ORIF or, in contrast, need to be followed by observation if not so severe, primarily to treat the injuries to other sites of the body (24).

It is often difficult to follow up these patients and evaluate the outcome of the injuries, since most of them cannot make a required visit, especially patients simply followed by observation. In patients treated by reduction and/or fixation, esthetic and functional recovery was mostly satisfactory, although these were not objectively evaluated. Even in patients followed by observation without reduction for displacement, morphological remodeling occurred to some extent. These patients seldom complained of deformity of the midface. Sensory disturbance of the infraorbital nerve region was sometimes persistent, but improved to some degree. Ocular symptoms such as diplopia mostly recovered; however, loss of vision was observed in a patient with fractures of the multiple sites.

In conclusion, the midfacial fractures showed a variety of features in terms of the site and severity and associated injuries. Understanding these features is important to manage these patients properly and also to promote clinical research to develop more effective treatment.

CONFLICT OF INTEREST: NONE DECLARED.

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