

# Changing Strategies in the Treatment of Maxillofacial Fractures at Thrace Region: Open Vs Closed Reduction

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## Abstract

**Objective:** We aimed to analyze etiological factors in patients with maxillofacial trauma, treatment modalities, complications related to surgical approaches and the changing patterns in over time.

**Materials and Methods:** A total of 126 patients diagnosed as maxillofacial fractures between August 1998 and June 2012 were investigated in Corlu State Hospital, Ear Nose Throat and Plastic Surgery Clinics, retrospectively.

**Results:** Of the patients, 92 male (73.01%) and 34 female (26.98%), the mean age was 26.4 ( $\pm$ 14.88). Traffic accidents as a cause of fracture were detected in 47 (37.3%) cases. The other causes were assaults in 34 (26.98%), sport injuries in 23 (18.25%), fall from high in 12 (9.52%) and work-related accidents in 10 (7.93%) patients, respectively. In patients with maxillofacial fractures, 65 (51.58%) of them were nasal, 37 of them were (29.36%) mandible, 6 of them were (4.26%) maxilla, 8 of them (% 6.34) were isolated zygomatic arch fractures. Multiple fractures were detected only 10 patients (7.93%). As a surgical method, closed reduction in 75 (59.52%), open reduction and internal fixation in 29 (23.01%), inter-maxillary fixation with open reduction and internal fixation in 13 (10.31%) and only inter-maxillary fixation in 9 (7.14%) cases were performed. Complications were detected as 10.31% of patients in postoperatively.

**Conclusion:** Open and closed reduction techniques are safe and successful methods. While closed reduction of mandibular fractures were used as a surgical method previously, combined approaches are now being applied instead of it.

*Key Words: Maxillofacial Fractures, Open versus Closed, Treatment*

## Introduction

The maxillofacial traumas forming the major part of general body traumas are among most frequently encountered traumas seen in Ear Nose Throat (ENT) and Plastic Surgery clinics. Although various etiological reasons have been reported in connection with the region where the studies were conducted and the socioeconomic, geographical and seasonal conditions, two most frequently encountered reasons were reported as traffic accidents and assaults [1-4].

Direct graphscan be asked from the patients who are suspected to have maxillofacial fractures (MFF). Of the direct graph images the Town graph and panoramic graph indicate mandible; the Caldwell and Waters' graphs indicate mid-facial and forehead regions; and lateral nasal graph shows the nasal bone. In 92% of mandible fractures the panoramic graph is the diagnostic one [5]. In addition, the panoramic graph can be used as the control graph after reduction. When it is needed to detect additional fractures and to verify the other regional fractures in patients with mid-facial traumas, axial and coronal Computerized Tomography (CT) and, if needed, three dimensional CT are accepted as the golden standard [1].

In the treatment of MFF both of the closed and open reduction methods can be performed. Although closed reduction is still the most frequently applied surgical method in especially nasal bone and zygomatic fractures, solely Maxillo-Mandibular Fixation (MMF) procedure frequently applied in dealing with other bone fractures in the past years are being replaced by mini-plate and screw fixation methods, or by combined approaches [6].

In Thrace region which is a bridge between Europe and Asian sides of Turkey, because of the traffic density, as it is high, traffic accident numbers are excessive and because of this reason maxillofacial traumas and fractures are high. Also, we determined traffic accidents were most frequently encountered reason of trauma. In this study we have performed a retrospective statistical evaluation of the patients with maxillofacial fractures who have applied to our hospital in the Thrace region for the last fifteen years. We aimed to present the changing nhospitalization periods and process of our treatment approaches for the last five.

## Materials and Methods

The files and office records of 126 patients who applied to Corlu State Hospital (CSH) between August 1998-June 2012 and who were clinically and radiologically diagnosed to have MFF and operated accordingly have been studied retrospectively. Ethical approval was given for our clinical study numbered as 2012/1.

The age and gender range of the patients, the reasons of trauma and their seasonal distribution and fracture locations and their percentages, treatment manners, complications and treatments, if present, have been studied. The lapse of time between the trauma and the operation (TOP- Trauma Operation Period), and post-operative average hospitalization period (PAHP) were figured out and it was investigated whether it displays a normal distribution through visual and analytical methods.

The PAHPs before and after 2008 were statistically

compared by using the paired samples- *t* test, and the result  $p < 0.05$  was accepted statistically significant. Similarly, the TOPs before and after 2008 were compared by using the paired samples-*t* test and the result  $p < 0.05$  was accepted statistically significant.

### Results

Of the total number of patients it was found that 92 of them were male (73%), 34 were female (27%), and the mean age was 26.04 ( $\pm 14.88$ ). We determined that in 47 (37.3%) cases traffic accidents were most frequently encountered reason of trauma. The other major reasons were assaults in 34 cases (27%), sports injuries in 23 (18.25%), in 12 (9.52%) who fell down from a high place and in 10 (7.93%) suffering from industrial accidents (Chart 1). Isolated fracture was detected in the nasal bones of 65 patients (51.6%), in mandible bones of 37 patients (29.4%), in maxillary bones of 6 patients (4.3%), in zygomatic bones of 8 patients (6.3%) whereas fractures were found in bones more than one in 10 (7.9%) patients (Chart 2).

The case of MFF was more frequently encountered (34.28%) in the summer especially in June and July whereas in the months of November and April, MFF was the least encountered. Although it was established that in the period between August 1998 and January 2008, TOP was found to be 4.32 days ( $\pm 2.18$ ), PAHP was 3.56 days ( $\pm 1.52$ ), the values were found to be 3.38 ( $\pm 2.01$ ) days for TOP and 2.42 ( $\pm 1.12$ ) days for PAHP between January 2008 and June 2012. When the values of TOP before and after 2008 were statistically compared, *p* value was found as 0.015; when the values of PAHP before and after 2008 were statistically compared, *p* value was found  $< 0.0001$ . It was displayed that there was a difference between the periods of TOP and PAHP before and after 2008, and that this difference was statistically significant.

Closed reduction was performed in 75 cases (59.52%); open reduction and internal fixation (ORIF) (Figure 1a and 1b) through mini-plate and screw were performed in 29 cases (23.01%); MMF and ORIF were performed in 13 cases (10.31%) and only MMF was performed in 9 cases (7.14%) (Chart 3). In cases with isolated nasal fractures after the closed reduction operation vaseline gauze anterior nasal packing or polyvinylalcohol (Merocell®) or silicon nasal splint (Doyle®) were applied into both nostrils as anterior nasal package. As for external nasal fixation plaster and splint (thermo plastic or aluminum) was applied. The intranasal packages were removed 48 hours later and external splints used in external fixation were removed 8 days later. Chart 4 shows the differences between the uses of these materials as per years. Only MMF was performed in 9 (22%) out of 41 cases with mandible fractures; only ORIF was performed in 22 cases (53.65%); and both MMF and ORIF were performed in 10 cases (24.4%). Eight out of 9 patients on whom only MMF was performed were operated on between 1998 and 2008. Six (75%) out of 8 cases with maxilla fracture received ORIF, and 2 cases (25%) received MMF. These were mid-facial fractures, and 6 of these fractures were Le Fort 2 type, and the remaining 2 were Le Fort 1 type fracture.

While 8 out of 13 cases with zygomatic fractures (61.53%) treated closed reduction with Gilles technique, ARIF was performed in 5 cases (38.46%). After the operations, complications occurred in 14 cases (11.4%), infection occurred in 5 (4%); malocclusion occurred in 5 cases (4%), temporomandibular joint dysfunction (TMJD) occurred in 1 case (0.8%); facial symmetry was seen in 3 cases (2.4%). While 9 (6.81%) of these complications involved patients who were operated on in the period between 1998 and 2008, 5 (4%) of them received operations between 2008 and 2012 (Chart 4). All the patients who developed infections were treated with double anti-biotherapy and dressing. Two of

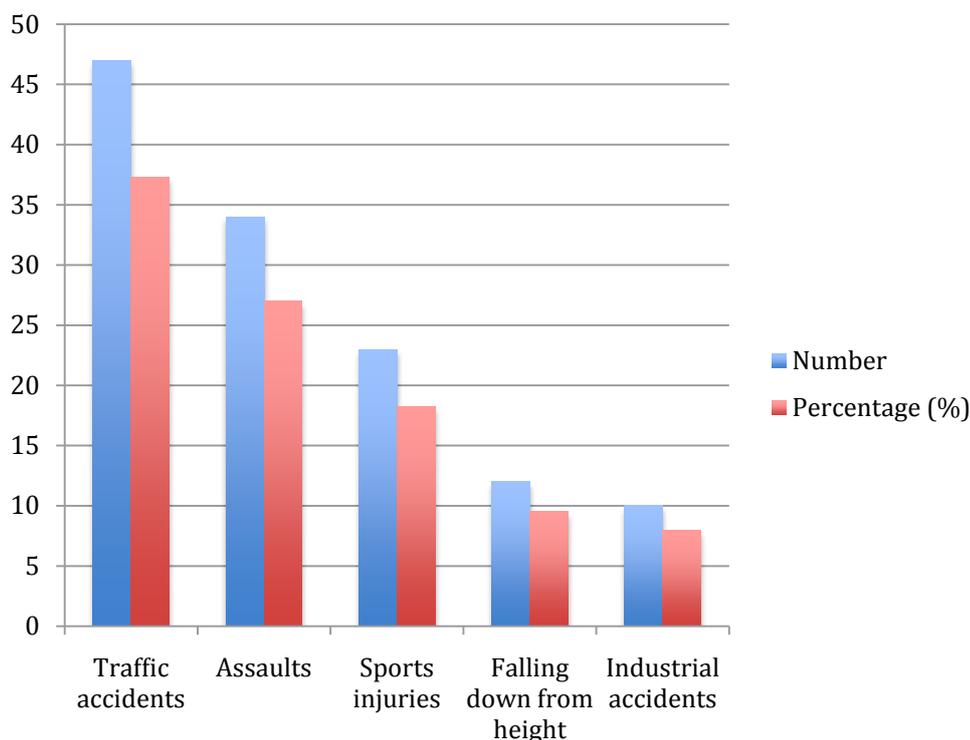
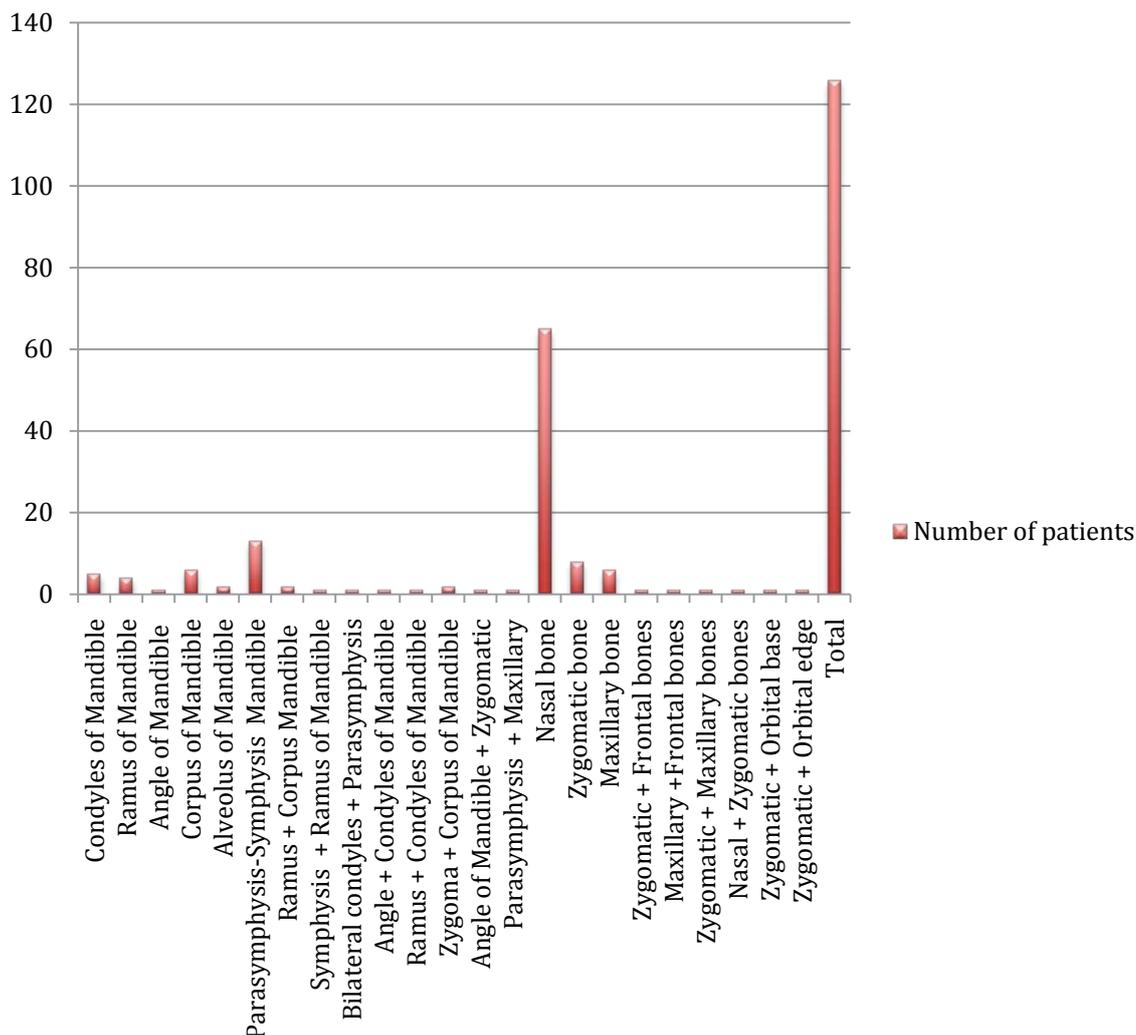


Chart 1. Etiological causes.

## Fracture region



**Chart 2.** Fracture regions and number of patients.

the cases with malocclusion were re-operated on and their occlusion problems were solved. Meanwhile 1 patient was referred to orthodontic treatment, 1 patient rejected remedial surgery, and 1 patient didn't show up in post-operative checking. In a case with TMJD partial treatment was achieved by way of physical therapy. Three of our cases with facial asymmetry had maxillofacial and cranial multiple trauma in their etiologies; no remedial surgery was considered for these patients with their sociocultural status on mind.

### Discussion

Frequent occurrence of MFF in male patients is common in the literature. In our series the male rate was 73%. We found this rate rather close to the studies conducted by Ozkaya et al. [7] and Bormann et al. [8]. It has been emphasized in various studies that the reason of this male dominance was due, along with the fact that they spend more time in traffic, to their involvement in assaults and participation in sports activities more often and their involvement in hazardous occupations and wider existence in business life [1,8,9]. In the etiology of MFF, "assaults" tops the list in developed countries whereas in developing countries traffic accidents are the main culprit [7,10,11]. The reason of this has been emphasized in various publications [11,12] that traffic rules are more meticulously

obeyed, primarily the rule of using seat belts. In line with the literature, we found that the most frequent reason of MFF was traffic accidents (36.5%) and the second most frequent reason was assaults (27%) [8].

Although Montovani et al. [13] and Al- Khateeb et al. [2] determined that mandible was the most frequently afflicted spot, Alvi et al. [14] de Villers [15] and Hussain et al. [16] found it to be nasal bone. In our study, we think that some of the reasons why nasal fracture tops the list are: our hospital functions as first step medical facility, ENT and Plastic Surgeons, and nasal fractures are generally referred to the ENT specialist whereas other MFFs are referred to Plastic Surgeons. Although 11 of the nasal fracture cases were operated on by Plastic Surgeons, 54 of them were performed by ENT specialists.

Various countries and regions have contradictory studies about the most common localization of the mandible fractures. In various publications from mostly developed countries, condyle fracture has been indicated as the most frequent localization [8,17]. In our study we have found, just like in many studies conducted in our country [3,18,19], that the most frequent localization is at symphysis and parasymphysis (10.31%), the second most frequent area has been found to be the corpus area (4.8%). The reason for this is that condyle fractures occurred due to blows received laterally and the most

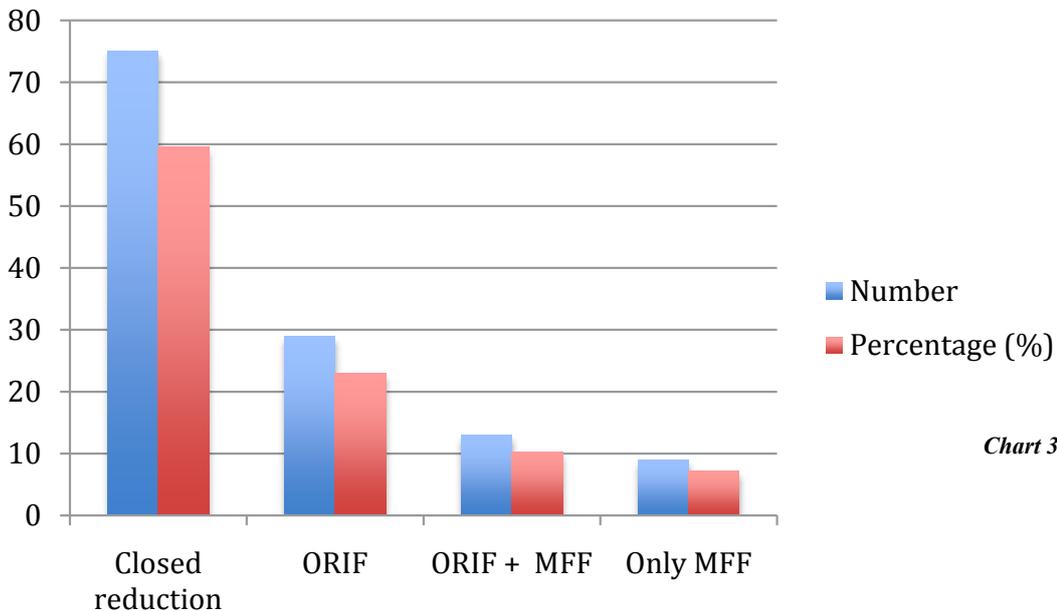


a

**Figure 1 a-b.** Pre- and postoperative roentgenograms of a selected case as mandible fracture.



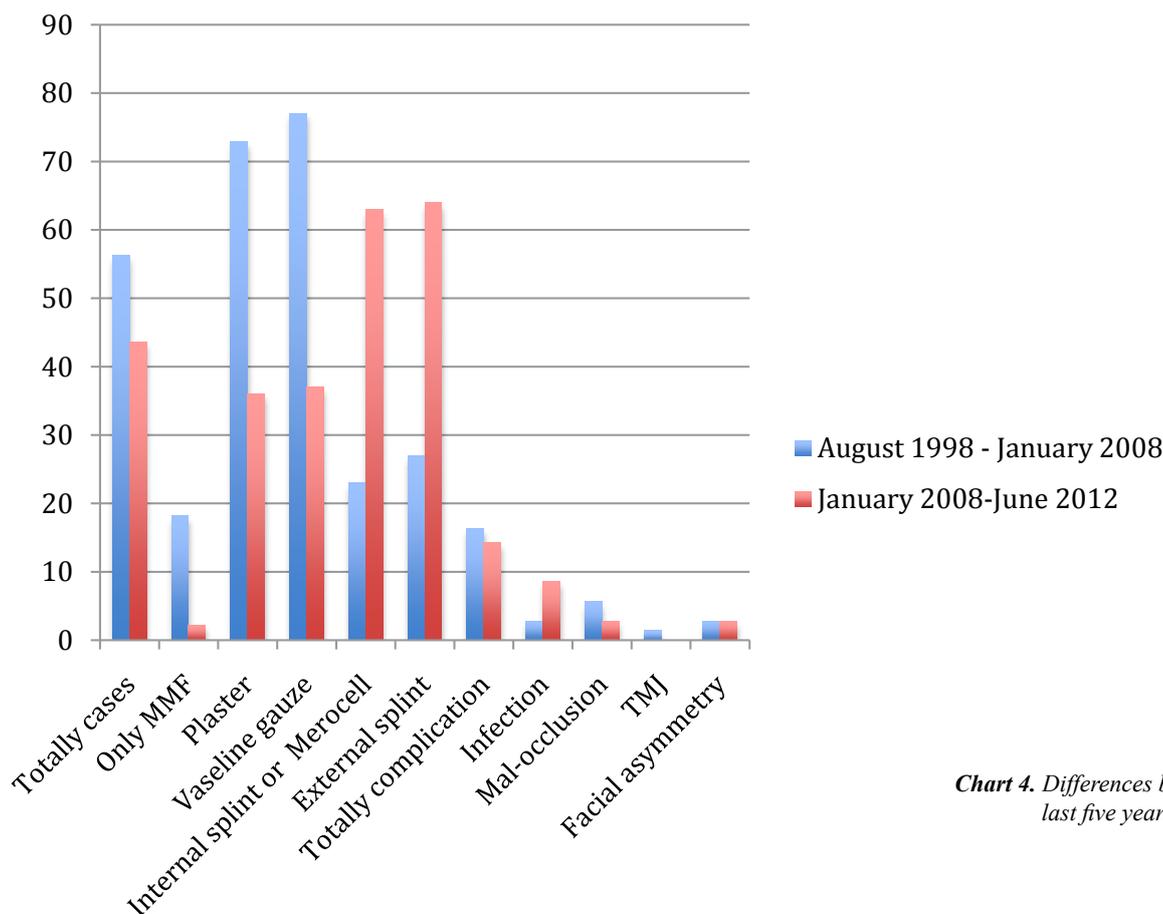
b



**Chart 3.** The surgical techniques and number of patients.

frequent etiological reason was reported to be assaults; as for symphysis and parasymphysis fractures they are generally due to blows received anteriorly and the most frequent culprit is traffic accidents [3,8,17-19]. It has been reported in various publications that the frequency of MFF increases in summer months. We also established that June, July and August are the months when MFF is the most frequently

encountered period similar to the results obtained by Erol et al. [1]. In Thrace region which is a bridge between Europe and Asian sides of Turkey, because of the traffic density, as it is high, traffic accident numbers are excessive and because of this reason maxillofacial traumas and fractures are high in summer months. Also, we determined traffic accidents were most frequently encountered reason of trauma.



*Chart 4. Differences between the periods of last five years and before.*

The techniques used in the treatment of the mandible fractures are closed reduction and MMF and ORIF and their combinations. MMF can be performed in condyle, non-displaced parasymphysis, coronoid, alveolar fractures. However, in these techniques oral hygiene is difficult, and nourishment problems may occur and TMJD may develop. It is difficult to perform MMF in patients or children with special social or medical problems as psychosis and epilepsy. It is necessary to perform ORIF in most of the displaced angulus, corpus, symphysis and parasymphysis fractures. For open reduction external or intraoral approach methods can be used [1]. In the external approach, although the lower border of mandible (Risdon incision) provides a convenient access intraoral approach (Keen incision) is more widely preferred due to the damage risk to marginal mandible nerve and the formation of a scar in the skin of the neck area [20]. In our study, 1 patient out of 9 on whom we performed only MMF was operated on in the last 5 years. We have explained the reasons why we used this method more often in the past with the facts that mini-plate and screw sets were not under the reimbursement coverage of the social security organizations in certain periods and the bicortical mini-plate and self-tape screw systems which we use today were not in common use, and the technical difficulties of performing the mini-plate techniques. When we compare the complication rates of our cases in the last 5 years, we think that the increased infection frequency was due to the fact that open approach methods were more frequently performed. Fayazi et al. emphasized that, fracture location of the mandible seems to be more likely

correlated in producing particular long-term complications in closed reduction approaches [21]. Nevertheless, beside the increased infection frequency in the open approach methods is emphasized in various publications [22-23], there are publications defending just the opposite and reporting incidence of closed method with more frequent infections [5]. We have explained the reasons why the malocclusion, facial asymmetry and TMJD complications have decreased with the facts that the frequency of using MMF methods together with the internal fixation through mini-plate and screws or through open reduction and early mobilization of temporomandibular joint. Open and closed reduction techniques are safe methods that provide good fixation. In the past years only maxilla-mandible fixation methods which were often used in the mandible fracture surgery, are replaced by only open reduction and internal fixation or combined methods. Malocclusion, facial asymmetry and TMJD rates have been gradually decreased owing to more frequent use of the open reduction methods in the recent years although the rate of infections complications have become more often. In the light of these results, it has been possible to reduce the hospitalization period and the costs concerning the patients who applied with MMF diagnosis owing to the improvements in the technological substructure and surgical techniques experienced in time.

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