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ULTRA SONOGRAPHY IN ZYGOMATIC ARCH FRACTURES

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ABSTRACT

Background: - Zygomatic arch play a very important role in the facial contour, trauma to the zygomatic arch causes malposition and hinders the jaw moment. Maxillofacial trauma has been Depending on the radiological investigations for the diagnosis of the facial bone fractures. The aim of the study is to evaluate ultrasonography as diagnostic aid for zygomatic arch fractures.

Methods: - A prospective study was done in 10 patients with ZMC fractures. ultrasonography was done bilaterally along with the conventional SMV radiographic view.

Results: - Ultrasonography was accurate in assessing the zygomatic arch fractures.

Conclusion: - Ultrasonography offers a safe, easily accessible, economical and accurate adjunct to conventional radiography for the diagnosis zygomatic arch fractures.

INTRODUCTION

The gross shape of the face is influenced largely by the underlying osseous structure, the zygoma plays an important role in facial contour and its mal-position can also affect the normal unhindered excursion of the coronoid process of the mandible. Fracture of the zygomatic arch most frequently are the result of fracture of the entire zygomatic maxillary complex. The incidence of these injuries varies, but usually isolated zygomatic arch fracture constitutes fewer than 10% of the zygomatic injuries.

Plain films and CT (Computed Tomography) have their place in determining the type, location, magnitude and direction of displacement of zygomatic arch fractures. The submentovertex view (SMV) (Figure 1), which is traditionally used as the first step in the diagnosis of zygomatic arch fractures, has its own limitation. On the other hand, the towne`s view, concentrated on the face, may show both zygomatic arches more easily, especially in the case of patients who cannot tolerate head extension. The use of CT for the diagnosis of malar fractures has become more common in recent years [1]. The main disadvantages of CT are the patient`s exposure to a high dose of radiation and the potential risk of development of cataract [2]. It cannot be used in pregnant women and in those with cervical spine injuries.

Ultrasound has traditionally been used in orbital and occular diagnosis, but its role in maxillofacial trauma is less widely recognized.

The use of ultrasound in the diagnosis and management of facial trauma has been reported previously. McCann *et al* [2] used ultrasound with 85% accuracy in diagnosing fractures of the zygomatico-maxillary complex. According to Friedrich *et al* [3], application of ultrasound is most useful for visualization of the zygomatic arch and the anterior wall of the frontal sinus. This study is utility of ultrasonography in fractures of the zygomatic arch compared with SMV films of preoperative and postoperative patients.

Patients and methods

The study was conducted in division of oral and maxillofacial surgery, Rajah Muthiah Dental College and Hospital. This study consists of 10 patients, 9 male and one female, with zygomatic complex fracture.

Submentovertex films were taken for all the patients bilaterally. The fracture of zygomatic arch was identified in all the cases. Patients had undergone ultrasonographic examination of zygomatic arch preoperatively and postoperatively.

A Philips ultrasound system with 7.5 MHz small linear transducer was used. The patient head was turned to the opposite side while he or he was being examined in the supine position. After application of sterile gel, the probe was situated over the fractured arch transversely (figure 2) and its whole length was evaluated. Any interruption in the continuity of the white line of the arch contour, including displacement or depression was considered as fracture (figure 3). Same procedure carried out for the opposite normal arch (figure 4).

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All of the sonograms were taken and interpreted by sonologist, who was not aware, the results of radiographic findings.

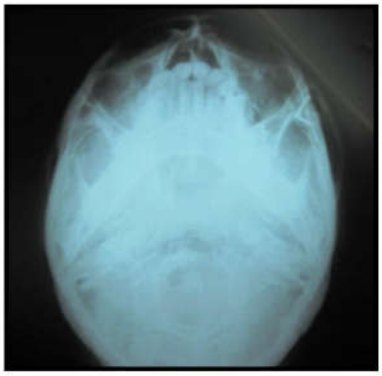

Figure 1:- Pre-operative SMV view

Figure 2 :- Position of the patient and probe during ultrasonography

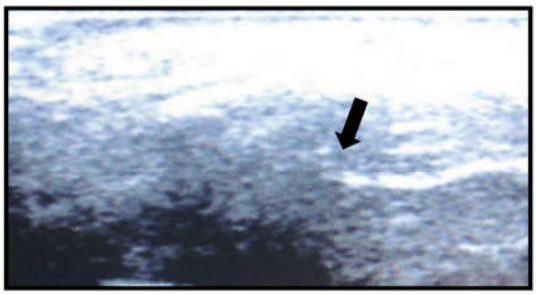

Figure 3 :- Fractured arch

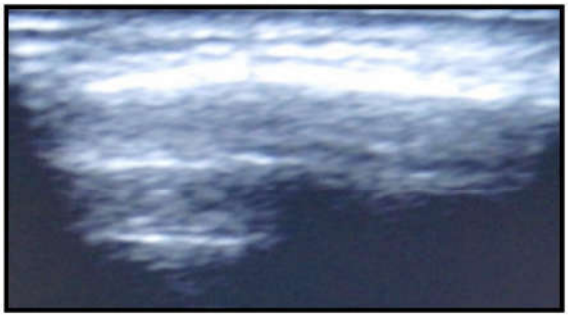

Figure 4:- Normal arch on the opposite side

Fractures of zygomatic arch was identified as interruption in white line, the data obtained from ultrasound investigation were compared with SMV for sensitivity, specificity and predictive values.(figure 5)

The patients had undergone closed reduction of zygomatic arch fracture. Postoperative ultrasonographic findings with the submentovertex film were compared, and comparative study was also done between preoperative and postoperative ultrasonographic findings.

Figure 5 :- A 25 year old man with right Zygomatic Arch Fracture

5A (Submentovertex view)

5B (USG view of right arch medially displaced)

RESULTS

Out of 10 cases, 9 were men and one was female, the patients were between age group 23 to 78 years. The nature of injury was RTA (Road Traffic Accidents) in 8 cases and self fall in 2 cases. In Submentovertex X-ray, the fractures showed M-shaped displacement in two cases, medial displacement in three cases and step fractures in five cases. Ultrasound was accurate in assessing the fractured zygomatic arches. The ultrasound images were concordant with the radiological findings in all normal and fractured zygomatic arches.

The usual ultrasound scan for one zygomatic arch examination took less than 6 min, and none of the patients found the procedure painful or uncomfortable. All the displaced arches were treated with closed reduction, and post op radiology and ultrasonographic findings shows satisfactory reduction and patients improved functionally and aesthetically.

DISCUSSION

Craniofacial trauma still remains a common problem and significant work load in many maxillofacial units [3]. Fractures of the facial bones account for fewer than 15% of all maxillofacial injuries with a ratio of mandibular to zygomatic to maxillary fractures of 6:2:1 [4]. Although the management has evolved considerably from wiring the fractured segments together to plate osteosynthesis, complex midface fractures can still result in cosmetic and functional deformity, so the surgeon must be assured of sufficient repositioning of zygomatic complex fractures. In such patients, especially those who have zygomatic arch fractures; the correct alignment of the arch ensures sufficient sagittal projection of the zygomatic complex and prevents broadening of the facial width. Also, a compressed zygomatic arch denotes that the lateral part of the zygomatic body is displaced posteriorly. For these reasons,

many authors [3,5] considered the zygomatic arch the key in complex midfacial fracture repair.

Even though the lateral and inferior orbital rim could be exposed during surgery, they do not reflect the position of the zygomatic bone adequately, as correct alignment in these regions may be accompanied by an unrecognized distinct depression of the lateral part of the zygoma. Furthermore, the use of zygomatico-maxillary buttress, as an assessment tool, is often uncertain because the fracture is usually comminuted at this site and it requires an additional surgical approach, which would be considered non essential. So it was suggested that the assessment of zygomatic complex fractures reduction via palpation only is not enough especially in cases of zygomatic arch fractures with a different kind of displacement and with only impressed fragment or with a missing interfragmentary contact. This is because the repositioning movement is not so clearly detectable. Also, in patients with combined fractures, there are several fragments being in a false position and the soft-tissue swelling persistence will complicate the clinical evaluation. That is why postoperative imaging, after treatment of zygomatic complex fractures is of prime importance.

The aim of any imaging examination for maxillofacial injuries is to evaluate the positions of the anatomic elements, both hard and soft tissues, in three spatial planes. Many modalities and techniques are available to facilitate this aim since the use of conventional X -rays for diagnosis of trauma. In the first part of the 20th century, the plain film radiographs were the basis for diagnosing fractures of the maxillofacial skeleton [3,4]. The application of computer processing to the principles of tomography by Godfrey Hounsfield and Allan M. McCormack resulted in the introduction of CT in the late 1970sand 1980s. CT was the first technology capable of allowing visualization of both hard and soft tissues of the facial bones by image processing enhancement. It was reported that CT can achieve more accurate values in diagnosis of midface fractures and reconstructed 3D images, which are introduced to medical sciences, have high accurate results

The assessment of the zygomatic complex fractures by CT with 3D reconstruction is an accepted tool for primary diagnosis of such trauma. Nkenke *et al* [6] and Dolynchuk *et al* [7] reported that CT has been recommended for preoperative evaluation of midface fracture as a standard diagnostic technique. Orbital floor and its lateral and medial walls are better seen in CT images. Also, as severity of injury is increased, the need for CT is increased. In addition, the position of globe is better evaluated by CT images because of their two-dimensional nature where the axial CT slices; the optical contours can be easily estimated in comparison with the data of the healthy orbit. This is also proved by the study of Kim [8] and Choi. They concluded that CT images can provide a good visualization of the changes of the globe position before and after surgery.

The major drawback of CT is the exposure of the patient to ionizing radiation, the potential risk of developing cataract, limit its use in many patients, such as pregnant women and children. It is also too expensive and time-consuming to use in isolated simple fractures.

The use of CT for postoperative follow-up examinations has to be confined to certain cases, where information about fine structures such as optic nerve is needed. That is why many authors suggested application of CT in diagnosis of trauma and preferred the use of non-ionizing tools during the follow-up examinations to avoid harmful effect of radiation on patients and to decrease the treatment cost.

Ultrasonography is easy and quick to be performed; it is non-invasive and free of any risks. The possibility of ultrasonographic fracture visualization in the midface has already been described by many researches.

Ultrasonography is widely used in medicine. It is possible to perform both diagnosis and therapeutic procedures, using ultrasound to guide interventional procedures (for instance biopsies or drainage of fluid collections). Sonographers are medical professionals who perform scans for diagnostic purposes. Sonographers typically use a hand-held probe (called a transducer) that is placed directly on and moved over the patient.

In the present study, the results showed that the sonography is a reliable method as an imaging modality in cases of suspected zygomatic fractures.

The same result was stated by Friedrich *et al* [3]. They found that the major difficulty in the use of sonography in the diagnosis of midfacial fractures; was the verification of non displaced fractures without the presence of a step-like structure or dislocation, there is always the danger that the fracture may remain unnoticed.

In addition, this study revealed that the clinical value of sonography mainly depends on the examiner's experience. Moreover, there was another problem with the use of ultrasound in diagnosis of zygomatic complex fractures which is that a gross swelling and emphysema make the ultrasonographic visualization of bony surfaces difficult or even impossible. This was also reported by McCann *et al* [2]. The problem of this extensive swelling was overcome in the present study by choosing an ultrasound frequency of 7.5 MHz or less. This is in agreement with Gulicher *et al* [5]., study. During follow up period, the benefit of ultrasound images in evaluation of fracture reduction of the zygomatic complex was evident especially in the combined fractures of zygomatic bone and arch.

Akizuki and Michi [9] found that intraoperative ultrasound helpful in the reduction of zygomatic arch fractures. Since then ultrasonography has been used for different facial fractures with varying success. The majority of authors believe that ultrasound is the most useful for visualization of zygomatic arch fractures.

Ultrasonography seems to be the best visualizing tool for evaluation of fracture reduction that enables the surgeon to assess both the alignment of the zygomatic arch and the zygomatic body. The main advantage of ultrasound is that the examination requires only about 6 minutes.

The comparison of the results gained by submentovertex film and sonographic examination of these 10 patients showed that no fracture had been missed by sonography.

This is in agreement with the results of Jank *et al* [10]. On the other hand, if the clinical picturedoes not allow a reliable diagnosis, sonography is the suitable tool in case of emergency. In patients with the suspicion of a midfacial fracture, sonography offers an alternative to conventional radiographs as first line imaging. In this way it is possible to make a reliable diagnosis while at the same time avoiding X-ray exposure.

CONCLUSION

Although the study shows ultrasound is useful in diagnosing isolated zygomatic arch fractures, it is still not accurate enough to replace plain radiography and CT completely as the principal mode of imaging, especially in complex zygomatico-orbital fractures.

Ultrasound offers a safe, easily accessible, inexpensive, accurate adjunct to conventional radiography of the facial bones and is well tolerated by recently injured patients. The application of ultrasound in midfacial injuries is most useful for visualization of the zygomatic arch with immediate imaging after closed reduction. The other possible roles of ultrasound may include intraoperative assistance in closed reduction of the zygomatic complex fracture. The technique may be useful as an accurate adjunct to conventional radiography of facial bones by reducing the overall amount of radiation. It can be considered as the imaging of choice when there is a contraindication to CT or plain films, for example in pregnant women, patients with cervical spine injuries and in the assessment of uncooperative patients when CT and submentovertex are impracticable. However, the dexterity and skill of the sonologist is the determining factor.

References

1. Fonseca RJ. Oral and maxillofacial trauma (3rd edn). St Louis: Elsevier Saunders, 2005, pp 406, 621–640, 1039.
2. McCann J, Brocklebank M, Ayoub F: Assessment of zygomatico-orbital complex fractures using ultrasonography. *Br J OralMaxillofac Surg*. 2000; 38: 525.
3. Friedrich RE, Heiland M, Bartel-Friedrich S. Potentials of ultrasound in the diagnosis of midfacial fractures. Clin Oral Invest 2003; 7: 226–229.
4. Ellis III E, Reddy L: Status of the internal orbit after reduction of zygomaticomaxillary complex fractures. *J Oral Maxillofac Surg*. 2004; 62: 275.
5. Gulicher D, Krimmel M, Reinert S: The role of intraoperative ultrasonography in zygomatic complex fracture repair. *Int J Oral Maxillofac Surg*. 2006; 35: 224.
6. Nkenke E, Benz M, Maier T, Wiltfang J, Holbach L, Kramer M, Gerd H, Neukam F: Hertel exophthalmometry versus computed tomography and optical 3D imaging for the determination of the globe position in zygomatico maxillary complex fracture. *Int J Oral Maxillofac Surg*. 2004; 33:125.
7. Dolynchuk N, Tadjalli H, Manson P: Orbital volumetric analysis: Clinical application in orbitozygomatic-complex injuries. *J Craniomaxillofac Trauma*. 1996; 2: 56.
8. Kim T, Choi J: Normal range of exophthalmos values on orbit computerized tomography in Koreans. Ophthalmol. 2001; 215: 156.
9. Akizuki H, Yoshida H, Michi K: Ultrasonographic evaluation during reduction of zygomatic arch fractures. *J Craniomaxillofac Surg*. 1990; 18: 263.
10. Jank S, Emshoff R, Etzelsdorfer M, Strobl H, Nicasi A, Norer B: The diagnostic value of ultrasonography in the detection of orbital floor. *Int J Oral Maxillofac Surg*. 2004; 33: 13-18.

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