



RESEARCH ARTICLE

A NOVEL SIMPLIFIED RADIOPHIC TECHNIQUE FOR ZYGOMATIC ARCH –
AN ALTERNATIVE TO JUG HANDLE VIEW

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ABSTRACT

Background: Zygomatic arc fractures are very common next to nasal bone fractures. For proper management of fractures, its imaging is very important which is accomplished by jug handle view – a modification of submentovertexview. For this technique patient is required to extend his/her neck which is troublesome for patients with neck injuries.

Aims and Objectives: To devise a new simplified radiographic technique for patients with neck injuries, as an alternative to jug handle view.

Materials and Methods: The demonstrated new technique was performed on 20patients. It requires intra oral dental X-ray machine and an occlusal X-ray film with elimination of general X-ray machine and extra-oral cassette. The image of zygomatic arch to rule out fractures is obtained with normal head position of patient in sitting direction which is easy for patients with real or suspected cervical injuries.

Conclusion: This novel technique is easier, cheaper, performed in conventional dental set up, with less radiation exposure on patients with cervical injuries, thus overcoming the drawback of jug handle view.

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INTRODUCTION

The Zygomatic arch or cheek bone is formed by the zygomatic process of temporal bone and the temporal process of zygomatic bone, the two being united by an oblique suture known as zygomaticotemporal suture. Zygoma is a very crucial component as it maintains facial contour. Fractures involving zygoma is very common, in fact it is the second most common facial bone to get fractured following facial trauma after nasal bones fracture. Fracture and dislocation of this bone not only causes cosmetic defects but also disrupts ocular and mandibular functions too. The four articulations of zygoma which can be involved in fractures include zygomatico-maxillary complex, zygomatic complex proper, orbitozygomatic complex. Fractures involving zygoma can cause both functional and cosmetic defects resulting from the pressure on the coronoid process or ankylose with the mandible and that's why they should be repaired as early as possible. Fractures of zygomatic arch can be simple or compound. Some of the zygomatic arch fractures may be in the form of isolated fractures in the arch only and result from

localized forces landing on the face laterally and having relatively less impact, especially in sports and blow injuries. The others are in the form of a component of zygomatic bone fractures, or Le Fort III level fractures (Thiagarajan et al., 2013; Ozyazgan et al., 2007). Depression over the involved side of face with restricted mouth opening because of interference with movement of coronoid process is the most common clinical feature of zygomatic arch fracture, requiring immediate treatment. For proper diagnosis and management of fracture imaging of zygomatic arch is must which is done with jug handle view radiograph (a modification of submentovertex view). For obtaining this radiograph patient is required to extend his/her neck so that vertex point of skull touches the cassette, which is not possible for patients with cervical injuries. In such cases replacing jug handle view other imaging modality is computed tomography scan (CT scan). The availability, expense, trained operator and high radiation exposure limits the use of CT scans for imaging this small bone (Siddana et al., 2014). Thus the present new radiographic approach is devised with the aim to radiograph zygomatic arch in patients with suspected or real cervical/neck injuries. The

technique can be performed in conventional dental set up using occlusal film and follows the principle of radiation protection and safety- ALARA (as low as reasonably achievable).

MATERIALS AND METHODS

20 patients who visited outpatient department of Oral Medicine and Radiology, PDM Dental College and Research Institute, Bahadurgarh, India were randomly selected for taking jughandle view and the newer devised technique. Later both the radiographs were compared visually by post graduate staff for correct visibility and evaluation of zygomatic arch.

Armamentarium

The armamentarium required for jug handle view

- General X-ray machine.
- Extra oral film cassette.
- Lead apron.
- Darkroomandequipments.
- X-ray film dryer.

The armamentarium required for the new technique includes

- Conventional Dental X-ray machine.
- Dental chair.
- Lead aprons.
- Occlusal X-ray film.
- Dark room and equipments.
- X-ray film dryer.

The new simplified imaging technique was performed with Dental X-ray machine and parameters used for the technique were with 70kilovolts (kvp), 10Milliamperes (mA) current and 0.65 seconds exposure time.

Patient positioning and film placement: The patient is made to sit in upright sitting position with proper head support in the dental chair such that midsagittal plane is perpendicular and occlusal plane is parallel to the floor. The patient and dentist must wear lead aprons for radiation protection. And the patient is not required to extend the neck, not even need to tilt the head.



Figure 1. Patient position and film placement



Figure 2. Position of aiming device



Figure 3. Clear image of Zygomatic arch

The occlusal film is placed at the lower border of mandible of the involved side or the fractured arch to be radiographed. The film is placed such that medial side of film is approximately 1cm medial to the lower border of the mandible and lateral border of the film should be in line with the outer surface of the zygomatic arch. The anteriorend of film should be in line withcorner of mouth. Patient's same side thumb is used tohold the film in desired position (Figure-1). The X-ray beam should pass through the zygomatic process meeting the occlusal film at right angle. For this the aiming device is placed over the temporal fossa in line with the lateral surface of the skull (Figure-2).

DISCUSSION

The zygomatic arch is a component of the zygomatic complex and makes up part of the anterior-lateral region of the face. Because of its convex curvature, the arch is more prone to trauma. After getting fractured, the zygomatic arch loses its convexity showing a depression of the involved side, which is a clinically visible, palpable, and aesthetically compromising condition. If not treated earlier functional deficiency may also

occur when mandible movement get restricted due to impaction of the coronoid process in the fractured zygomatic arch. If not treated properly, this situation could progress to extra-articular ankylosis also (Santos *et al.*, 2011). Zygomatic arch fractures often occur as part of a zygoma fracture or Le Fort type III fractures of the maxillary. Isolated fractures of the zygomatic arch comprise around 10% of all zygoma fractures. The fracture occurs commonly due to road accidents, falls, assaults, and sport injuries or accidents. Treatment may involve minimally invasive surgical procedures for slightly dislocated and isolated arch fractures or surgery with more extensive access for large dislocations of bone segments and multiple components involvement like Le Forte fractures (Santos *et al.*, 2011). Conventionally Jug handle view is taken for evaluation of zygomatic arch which is modification of submentovertex view when quality of X-ray beam (mean and total energy) is reduced by reducing the kVp. This allows the soft (low energy) X-rays to get absorbed within the face and skull. This view/technique requires the patient to face the X-ray source and hyperextend the neck till the vertex of skull touches the detector. The canthomeatal line should be approximately perpendicular to the floor and parallel to the film plane. The horizontal central ray is directed in the midline to a point midway between the mandibular condyles and exits the vertex of the skull (Siddana *et al.*, 2014; Santos *et al.*, 2011; White and Pharoah). This extension/hyperextension of neck induces stress in the neck, making it troublesome and unsuitable for patients with neck/cervical injuries. Neck injuries are common in patients with zygomatic arch fractures. In these situations, the alternative or existing choice of imaging is computed tomography. The availability, expense, trained operator and high radiation exposure limits the use of CT scans or is questionable for imaging this small bone. In the suggested new technique for imaging zygomatic arch, the patient need not to extend the neck making it possible in cases with neck injuries (Siddana, 2014; Watson, 1974). Siddana S G, Muniraju M in 2014 demonstrated this technique not only in upright sitting position but in supine position also, here the patient is made to lie down on the radiographic table in a supine position with a lead apron, so that the midsagittal plane is oriented parallel and occlusal plane is oriented perpendicular to the floor (Siddana *et al.*, 2014). As this technique can be used in conventional dental setup with occlusal film and not

require general X-ray machine and extra-oral film/cassette, it is inexpensive and follows ALARA principle. By using a dental X-ray machine the quantity of radiation is reduced because 10 mA is used as compared to the 50 mA of a general X-ray machine and it improves the quality of the X-ray beam by operating at 70 kVp as compared to 30-40 kVp used in the jug handle radiograph (Siddana, 2016; White and Pharoah. Textbook of). It not only reduces radiation but also produces desirable good quality images of the zygomatic arch as shown in Figure-3. So the new technique is very useful in a conventional dental setup to rule out zygomatic arch fractures.

Conclusion

This new suggested technique is simplified zygomatic arch radiographic technique to overcome the drawback of jug handle view which can be applied in patients having cervical injuries or suspected cervical injuries. The technique is easy to practice, follows ALARA principle of radiation protection and safety and can be done in conventional dental setup to produce considerable good quality images of the zygomatic arch.

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