Pre- and postoperative head radiography and MSCT imaging in patients with zygomatico-orbital trauma

Poster No.: B-0726
Congress: ECR 2015
Type: Scientific Paper
Authors: O. Pavlova, N. Serova; Moscow/ RU
Keywords: Head and neck, Trauma, CT, Conventional radiography, Surgery, Outcomes analysis
DOI: 10.1594/ecr2015/B-0726

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR’s endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Purpose

The problem of zygomatico-orbital trauma nowadays is even more relevant than 10 years ago [1,8]. Incidence of which is increasing world widely every year due to the urban growth, developing mechanization and various substance abuse [7]. About 24-33% of all cases of maxillofacial injuries are presented with zygomatico-orbital trauma and it is only exceeded by mandibular trauma [2,5]. Males of the working age are the most exposed group with average disability rate about 23,5% [5,6]. One of the most typical and important clinical features is a multiply injury which includes bone and soft tissues and brain trauma. However, the problem of posttraumatic deformities is not less important. Usually and mostly it is presented with facial asymmetry, visual and ocular movement impairment, sensory decrement, loss of other functions [1,3]. The rate of posttraumatic deformities after zygomatico-orbital trauma continues to increase and at the moment reaches 25% [7]. Therefore the role of proper pre- and postoperative diagnostic modality in such injuries is very important and can hardly be overestimated. The aim of the study was establishing the best modality choice for accurate evaluation of the all injured structures before and after the surgical treatment [3,4]. Pre- and postoperative head radiography and MSCT scan were compared.
Methods and materials

A total of 45 patients with zygomatico-orbital trauma were admitted to the hospital on 1-3 day after the injury. The examined cohort consisted of 39 males and 6 females patients, in age range from 18 to 59 years. Road traffic accidents were the most common cause of the injury in 26 patients, followed by violence in 18 cases and in 1 case after sport injury. The majority of patients had unilateral fractures; only in 2 cases patients were presented with the two-sided trauma after severe road traffic accident. Preoperative head radiography and MSCT scan were performed at the day of admission. Postoperative head X-ray and MSCT images were obtained within 10 days after the surgery. X-ray diagnostics consisted of skull radiography in anterior-posterior, lateral and Waters’ (occipitomental) views. 40-slice MSCT data was completed with multiplanar reconstruction in coronal and sagittal views and 3D images. Zygomatico-orbital structures were reconstructed with implants and osteosynthesis elements.
Results

Preoperative head radiography was used as a first-line method. Since within the X-ray images structures overlapping each other, it was able to reveal only the most obvious diastatic fractures in frontozygomatic (n=42; 93%), infraorbital (n=29; 64%), zygomaticomaxillary (n=22; 48%) regions and maxillary sinuses opacification (n=35; 77%).

In comparison with the head radiography (Fig.1,2), MSCT scan allowed better assessment of the injured bone structures and soft tissue elements. Damaged orbital floor was found in 45 patients (100%), herniation of the soft tissues into the adjacent maxillary sinus with formation of enophthalmos in 6 (13%) along with affected oculomotor muscles (n= 8, 17%), injured optic nerve (n=2, 4%), fractures of lateral (n=43, 95%) and medial (n=3, 6%) orbital walls. MSCT provided detailed information about small bone fragments that could affect important soft tissue elements as well as visualization of edema, emphysema and increased orbital volume.

Postoperative head radiography revealed only approximate position of the implanted osteosynthesis elements due to the spatial resolution limitations (Fig.3).

Postoperative MSCT helped to assess position of implants and osteosynthesis elements, reconstructed anatomical units and condition of surrounding bone and soft tissues (Fig.4). In case of satisfactory outcome MSCT visualized reconstructed anatomical contours, almost normal orbital volume without herniation and enophthalmos in majority of cases. As complications of incorrectly implanted elements remaining enophthalmos (n=3, 6%), herniation of the soft tissues into the adjacent maxillary sinus (n=1, 2%) and affected oculomotor muscle (n=1, 2%) were found (Fig.5).
Fig. 1: Comparison of head radiography and MSCT in evaluating zygomatico-orbital complex injury (different cases). A. Head radiography, Waters' view reveals diastatic fractures in frontozygomatic (long thin arrow) and infraorbital margins (short thick arrow) on the right without detailed information about small bone fragments and affected soft tissue elements. B. Head radiography, Waters' view reveals diastatic fracture in frontozygomatic suture (short thick arrow) on the left. C. 3D MSCT image provides detailed information about position of the big and small bone fragments of the injured right infraorbital margin. D. Coronal MSCT helps to evaluate the distance between bone fragments in right frontozygomatic rupture (short thick arrow) and also to assess orbital and maxillary walls with adjacent soft tissue elements.
Fig. 2: Comparison of head radiography and MSCT in evaluating zygomatico-orbital trauma (different cases). A. Head radiography, Waters’ view shows obviously increased left orbital volume (inferior orbital contour - short thick arrows) because of the multiply orbital walls fractures (long thin arrows), compared to the normal orbital volume on the right. B. Head radiography, Waters’ view establishes that left maxillary sinus is opacified (short thick arrow). C. Coronal MSCT revealed multiply orbital walls fractures resulting in increased left orbital volume (compared to the normal orbital volume on the right) with detailed information about adjacent structures. D. Sagittal MSCT helps to differentiate pathological fluid in maxillary sinus from mucosal thickening.
**Fig. 3:** Head radiography in assessing postoperative effects after surgical treatment (different cases). A. Head radiography, Waters’ view shows approximate position of the implanted medial wall of the right orbit and reconstructed left orbital floor along with the other osteosynthesis elements. B. Head radiography, Waters’ view shows approximate position of the double implants of the left orbital walls. C. Head radiography, AP skull view doesn’t provide any detailed information about the reconstructed two-sided injured orbital floors. Approximately the left orbital volume is still increased as compared to the right one. D. Orthopantomogram also could provide some information about maxillary sinuses walls and implanted osteosynthesis elements (as in the example of the right sinus).
Fig. 4: Comparison between head radiography and MSCT in evaluating reconstructed zygomatico-orbital complex (different cases). A. Head radiography, AP skull view shows approximate position of the implanted right orbital floor. B. Head radiography, AP skull view doesn't provide any detailed information about the reconstructed two-sided injured orbital floors. Approximately the left orbital volume is still increased as compared to the right one. C. Coronal MSCT provides more information about reconstructed left orbital floor and adjacent bone and soft tissues. D. Coronal MSCT, anatomical reconstruction of the two-sided injured orbital floors.

© I.M. Sechenov First Moscow State Medical University - Moscow/RU
**Fig. 5:** Advantages of MSCT in assessing position of the implanted elements and adjacent structures (different cases). A. Coronal MSCT, correct reconstruction of the two-sided injured orbital floors. B. 3D MSCT image assesses right orbital floor implant and infraorbital margin's osteosynthesis elements. C. Sagittal MSCT shows correct anatomical cone-shaped position of reconstructed orbital floor. D. Coronal MSCT shows reconstruction of the two-sided injured orbital floors: the almost normal right orbital volume versus remaining increased left orbital volume and enophthalmos due to incorrect position of the orbital floor implant. E. Coronal MSCT allows to evaluate unusual reconstruction of right orbital floor using two implants resulting in soft tissue entrapment between them. F. Sagittal MSCT shows significant prolapse of the posterior part of the implant into the adjacent maxillary sinus (short thick arrow).

© I.M. Sechenov First Moscow State Medical University - Moscow/RU
Conclusion

The study has proved that head MSCT scan is the best choice for diagnostics of pre- and postoperative effects in severe zygomatico-orbital trauma. Head radiography doesn't provide enough information so we don't recommend it as a diagnostic method. MSCT is the best modality choice for assessing all injured orbital contents. It should be performed in certain time limits, preferable at the day of admission to the hospital and within 10 days after the surgery. This way is tend to be the most efficient diagnostic routine in patients with severe zygomatico-orbital trauma in order to exclude possible posttraumatic deformities.
References