CT Imaging of facial trauma. Role of different types of reconstruction. Part I – bones

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Summary

Background:
Injury to the facial skeleton and the adjoining soft tissues is a frequently occurring condition. The main aim of this work was to assess the value of multiplanar and three-dimensional (3D) reconstruction computed tomography (CT) images obtained by using multi-detector row technology in spiral data acquisition in patients with facial skeleton injury.

The authors attempted to answer the following questions: Are there particular mechanisms and types of injuries or locations of fractures which can be diagnosed significantly more effectively by conducting additional multiplanar image reconstructions? Do 3D image reconstructions contribute to the diagnostic process, to what extent? Compared to other imaging techniques, is the spiral CT data acquisition a more convenient for the patient and a faster investigation method of diagnosing post-injury lesions involving the facial skeleton?

Material/Methods:
Sixty-seven patients diagnosed with injury to the facial skeleton were referred for emergent CT scanning. Each patient underwent a CT scan with the use of a GE HiSpeed Qx/i scanner. The scans were conducted with the use of spiral data acquisition technique in the transverse plane.

The following secondary image reconstructions were conducted for each patient: a two-dimensional (2D) multiplanar reconstruction (MPR), maximum intensity projection (MIP), and 3D volume rendering (VR).

Post-injury lesions of the facial skeleton were assessed and the presence of any loose displaced bone fragments was taken into consideration.

Results:
As far as fracture imaging is concerned, the 2D image reconstruction and volume rendering proved to be the most effective in the majority of locations. 3D image reconstructions proved the most sensitive in most cases of loose displaced bone fragments, except for fine structures such as the ethmoid bone and the inferior orbital wall.

Conclusions:
1. Multiplanar computer reconstructions increase the effectiveness of visualisation of fractures, especially in the case of fractures in the inferior orbital wall. 2. 3D reconstructions are a good complementary technique allowing to locate loose bone fragments precisely and to assess the degree of displacement. 3. Spiral CT data acquisition increases patient’s convenience due to shorter time required for examination, and allows to conduct reconstructions of satisfactory value.

Key words: facial bone injuries • blowout fracture • computed tomography • CT

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Background

Injuries of facial bones and soft tissues are a very common pathology. Their incidence ranges from 20% to over 50% of cases admitted to Traumatic Emergency Room. The most frequent causes of these pathologies include: transportation injuries (up to 80% of cases), use of a direct force, mostly during an assault (up to 60% of cases), falls (up to 25% of cases), and accidents during sports (up to 10% of cases) [1–4].

The analysis and classification of facial bone fractures is possible with a model that was first partially introduced by Le Fort, at the beginning of the XX century, and improved in the next years by many authors [5,6]. It bases on the fact that the skeleton of the face is not just a collection of single bones, but constitutes a system of horizontal and vertical reinforcements, supporting one another mutually (and thus having a much higher mechanical resistance than other bone elements), transmitting forces and stresses.

The horizontal reinforcements include:
1. the basis of the frontal bone and upper margins of the orbits,
2. zygomatic arches and inferior margins of the orbits,
3. hard palate.

Paired vertical reinforcements stretch:
1. from the maxillary bone, through the medial walls of the maxillary sinus and orbit, up to the frontal bone,
2. from premolar teeth, along the lateral wall of the maxillary sinus and orbit, up to the frontal bone,
3. from the posterior surface of the maxillary bone, along the lamina of the pterygoid process of the sphenoid bone, along the posterior wall of the maxillary sinus, up to the base of the skull.

This structure of the facial skeleton allows for prediction of the consequences of injuries. Most often, the fissures of the fractures run perpendicularly to the columns transmitting the force. Very often, there occur multiple bone fractures. The mechanism of fracture of many, sometimes not adjacent bones, seems clear then.

Similarly, in the lower part of the facial skeleton, the reinforcement of the skull is provided by the mandible, which due to its connection with the temporal bones through temporomandibular joints may be regarded as a closed ring in the assessment of force transfer. This structure results in frequent, multiple fractures of the mandible [7].

Fracture of LeFort I type involves the lower parts of the maxillary bones and alveolar processes. The fissure of the fracture runs through the lateral, medial, and posterior walls of maxillary sinuses. There follows a separation of the hard palate.

Fracture of LeFort II type – the line of the fracture runs from the pterygoid process, through the anterior and lateral wall of the maxillary sinus, lower edge and medial wall of the orbit, and the base of the nose.

Fracture of LeFort III type involves the zygomatic arches, lateral and superior wall of the orbit, and the base of the nose. This type of fracture is sometimes called a craniofacial dysjunction.

Characteristic fractures of this region include also fractures of the zygomaticomaxillary complex. Due to the location of the fracture fissure, they are divided into 3 categories. The first one includes fractures of the zygomatic arch (Type 1), fracture of the frontal process of the zygomatic bone (Type 2), fracture of the lower orbital margin – maxillary process of the zygomatic bone (Type 3).

The second category includes fractures of all three processes of the zygomatic bone, with chipping of the zygomatic bone from the facial skeleton, i.e. so called ‘tripod fracture’. The third category includes comminuted fractures of the processes and body of the zygomatic bone [8].

An exact visualisation of all fissures of the fractures, mutual spatial relations of bone fragments, as well as the presence of comorbid complications of bone tissues, should allow for the fastest possible and adequate therapeutic management [9–12]. Frequent causes of delay in treatment onset include patient’s severe condition and no diagnosis or inadequate determination of fractures of the facial cranium [13,14]. In case of severe general health state of the patient, the most urgent issue is to stabilise his/her basic life functions, which delays the treatment of facial injuries. However, the fastest possible introduction of the treatment of these pathologies allows for avoidance of fixation of post-traumatic negative consequences. In every case, treatment results will be improve with a faster, more precise and minimally loading diagnostic process and evaluation of the trauma extent [15,16].

The oldest and most basic method of imaging of facial bone fractures is the classic X-ray, being a summative two-dimensional reconstruction of anatomical structures. In every image, complex, spatial bone structures of the face overlap, which decreases the sensitivity of the study. The examination allows only for a general assessment of soft tissues. However, it may be useful not only in the evaluation of fractures of bone elements, but also in the exclusion of the presence of foreign bodies, especially the metal ones.

Due to a complex structure of this region, an exact assessment of the location and range of post-traumatic lesions with classic X-rays may be difficult.

Disadvantages of classic X-rays include the difficulty to show clearly all complex bone structures of the facial skeleton and inability to assess soft-tissue elements of the face in detail [17].

A complicated anatomical structure of the facial skeleton, the diversity of possible traumatic lesions of this region, and the risk of complications require a fast introduction of appropriate diagnostic procedures for an exact evaluation [18]. Properly selected method of diagnosis and secondary processing of the acquired data, allows for an optimal conduction of the examination, in the most advantageous way, with obtaining as much information as possible.

In spiral CT, it is possible to obtain multplanar and three-dimensional reconstructions of bone elements, which
provides the operators with a better spatial orientation and allows for a better planning of surgery and monitoring of its results [19]. The recently used CT units with multi-row detectors allow for obtaining many sections during one turn of the lamp, which significantly shortens the examination time.

**Aim of the work**

The aim of the work was to evaluate the value of multiplanar and three-dimensional reconstructions of CT images obtained with the spiral, multi-row technique of data acquisition in patients with facial bone injuries.

The work aimed to provide answer to the following questions:

1. Are there any specific mechanisms or types of injuries or fracture locations in which the additional multiplanar image reconstructions significantly (statistically) increase the effectiveness of the diagnostics?
2. Do the 3D image reconstructions provide us with additional diagnostic information or can they be used independently?

**Material and Methods**

The material was analysed as a part of a doctoral dissertation supervised by Stanislaw Skrzeklewski, MD PhD.

The clinical material included 67 patients referred for an emergency CT with a diagnosed facial injury, in order to have the location and extent of post-traumatic lesions assessed.

Among the study patients, there were 58 men aged 8–71 years (mean of 34.7 years) and 9 women aged 21–74 years (mean of 42.7 years).

In general, patients’ age ranged from 8 to 74 years (mean of 35.8 years).

Every patient underwent a CT with a Hispeed Qx/i unit made by GE. Due to planned secondary reconstructions in every case, a spiral technique of data acquisition in transverse plane was used.

Raw data were obtained by using the following technical parameters: voltage of the lamp – 120 kV, amperage of up to 200 mA, collimation – 1.25 to 2.5 mm, and pitch (the rate of table translation during a 360° rotation of the lamp to the thickness of the slice) of 1.5. Rotation time of 0.5–0.7 sec. Acquisition time did not exceed 30 sec. The speed of the table – 7.5 mm per one turn of the X-ray lamp. The raw data were obtained in the algorithm of ‘standard’ and ‘bone’ reconstruction.

In every patient, the initial evaluation was based on sections acquired in the transverse plane. The images were reviewed in soft-tissue windows (window parameters – 350/35 HU) and bone windows (window parameters – 2200/200 HU). The following field of view was used: 180–250 mm.

Next, in all cases, the following secondary reconstructions were conducted: secondary, 2D, multiplanar reconstructions (MPR) and 3D volume rendering, also with surface-shaded display (SSD), on a graphical console ADW 4.0.

With every above presented method of reconstruction, a repeated evaluation of the obtained images was performed.

Two-dimensional, planar reconstructions were performed in the frontal and sagittal and oblique planes, parallel to the long axis of the orbits, to the hard palate, branches of the mandible, head of the mandible and temporomandibular joint.

The reconstructed slice was minimally 0.4 and 0.5 mm thick. In some well-grounded cases, these reconstructions were extended by the MIP option (maximum intensity projection), allowing for visualisation of the thickest slice (maximally to 15 mm).

We evaluated the traumatic lesions of the facial bones.

In case of post-traumatic bone lesions, the evaluation included also possible fracture fissures and free, dislocated bone chips.

The images were evaluated by two independent radiologists.

Post-traumatic bone lesions were classified on the basis of the anatomical location of fracture fissures and the presence of free, dislocated bone chips within:

1. orbits, with classification into the orbital walls,
2. frontal sinuses, with classification into the walls,
3. maxillary sinuses, with classification into the walls,
4. maxillary bones,
5. body, branches, and condylar process of the mandible,
6. zygomatic arches and bones,
7. nasal bones.

The next stage of our work was to compare the diagnostic value of the applied options of CT image presentation and reconstruction with regard to disease symptoms.

The clinical material including all patients was analysed three times, in different methodical groups, reflecting different methods of imaging and reconstruction.

In the first group, we assessed mainly the transverse sections, in the second group – 2D reconstructions, and in the third group – 3D reconstructions. Next, the sensitivity of transverse, planar, and 3D reconstructions in imaging of soft-tissue pathologies in different locations was compared.

**Statistical metod**

The statistical analysis of the obtained results was based on the Pearson’s chi² test, which defined the differences between the incidence of positive diagnoses in the studied semiotic groups and the severity of the lesions. In order to test the hypothesis on correlation between the method of imaging of different facial post-traumatic lesions and their location, we selected (on the basis of the analysis of
Diagnostic sensitivity is the rate (%) of patients in a study group with a positive test result. This reflects the ability of a given test to diagnose a disease:

\[
\text{Sensitivity} \, (\%) = \frac{\text{PD}}{\text{PD} + \text{FU}} \times 100\%
\]

Diagnostic specificity is the rate (%) of healthy individuals in a study group that obtained a negative test result:

\[
\text{Specificity} \, (\%) = \frac{\text{PU}}{\text{PU} + \text{FD}} \times 100\%
\]

Negative predictive value (NPV) is used to evaluate the probability of disease exclusion on the basis of negative study results:

\[
\text{NPV} = \frac{\text{PU}}{\text{PU} + \text{FU}} \times 100\%
\]

Positive predictive value (PPV) allows for qualification (on the basis of a positive test result) of a given patient to a group of patients (with a certain probability):

\[
\text{PPV} = \frac{\text{PD}}{\text{PD} + \text{FD}} \times 100\%
\]

PD – true positive results,
PU – true negative results,
FD – false positive results,
FU – false negative results.

The results were presented as ‘absolute incidence’. P of <0.05 was considered statistically significant.

CT examination of the face was conducted in all patients. In every case, the obtained data were presented in the transverse presentation (TP). Multiplanar (2D) and volumetric (3D) reconstructions were performed secondarily. The results of the conducted examinations were presented in tables.

The method (or methods) of image presentation and reconstruction with the highest absolute and significantly different number of diagnosed symptoms as compared to other methods of CT image processing, was considered to be the most useful from the diagnostic point of view. It was called a ‘reference’ method.

The tables included data on sensitivity and specificity, false positive and false negative results, as well positive and negative predictive values, defining the probability of true positive or negative results for the remaining methodical groups, where the result of examination (with respect to the specified groups and diagnosed anatomical symptoms) were evaluated as worse from the ones obtained with the method (or methods) called ‘reference method’.

**Results**

CT study of the facial cranium was conducted in every case. In every case, the obtained data were presented in the transverse presentation (TP). Multiplanar (2D) and volumetric (3D) reconstructions were performed secondarily. The results of the conducted examinations were presented in tables.

The method (or methods) of image presentation and reconstruction with the highest absolute and significantly different number of diagnosed symptoms as compared to other methods of CT image processing, was considered to be the most useful from the diagnostic point of view. It was called a ‘reference’ method.
Number and rate of patients with fractures in different anatomical locations:
1. fracture of the orbital walls 53 (79.1%),
2. fracture of the walls of the maxillary sinus 54 (80.6%),
3. fracture of the walls of the frontal sinus 19 (28.4%),
4. fracture of the body, branch, or condylar process of the mandible 16 (23.9%),
5. fracture of the maxilla 15 (22.4%),
6. fracture of the zygomatic arch 27 (40.3%),
7. fracture of the nasal bones 25 (37.3%).

The evaluation of the location of fracture fissures

In the evaluation of the fracture fissures, 2D reconstructions revealed the highest sensitivity for most of the locations. This was especially true for fractures within the inferior orbital wall and the superior wall of the maxillary sinus, with imaging sensitivity in the transverse plane amounting to 0.227273 and sensitivity of 3D reconstructions of 0.545455 (Figures 1, 2).

The highest sensitivity of imaging in the transverse plane was observed for fractures in the anterior wall of the maxillary sinus (0.941176) and in the lateral wall of the maxillary sinus (0.958333) (Figure 3).

The highest sensitivity of 3D reconstructions was observed for fractures in the maxillary bone (0.923077), zygomatic arches (0.92), nasal bones (0.913043), as well as body and branches of the mandible (0.9) (Figures 4–9).

Three-dimensional reconstructions turned out to be useless in the evaluation of fractures within the medial orbital wall and in the medial wall of the maxillary sinus (Tables 1–7).
The evaluation of the location of free, dislocated bone chips

Two-dimensional reconstruction revealed the highest sensitivity in imaging of bone chips within the orbital walls, as well as superior and medial wall of the maxillary sinus.

Two-dimensional reconstructions and transverse imaging turned out to be equally sensitive and specific in imaging of free, dislocated bone chips within the posterior wall of frontal sinus, and the lateral wall of the maxillary sinus. They were also much more advantageous than the 3D imaging.

The 3D imaging is the most precise in visualising free bone chips in the anterior wall of the frontal sinus, anterior wall of the maxillary sinus, and condylar process, branches and body of the mandible, zygomatic arch, nasal bones, and conchae.

Table 1. Number of fractures in frontal sinuses observed in different methods of reconstruction. Statistical significance.

| Location     | Presentation | p         |
|--------------|--------------|-----------|
|              | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Anterior wall | 35 | 41 | 38 | NS     | NS     | NS     |
| Posterior wall| 5  | 6  | 2  | NS     | NS     | NS     |

Table 2. Number of fractures in orbital walls observed in different methods of reconstruction. Statistical significance.

| Location     | Presentation | p         |
|--------------|--------------|-----------|
|              | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Medial wall   | 12 | 13 | 2  | NS     | p<0.05  | p<0.05  |
| Lateral wall  | 43 | 46 | 39 | NS     | NS     | NS     |
| Superior wall | 10 | 19 | 12 | p<0.05 | NS     | p<0.05  |
| Inferior wall | 26 | 71 | 36 | p<0.05 | NS     | p<0.05  |
zygomatic bones, in fractures of ‘tripod’ type. It turned out to be useless in the evaluation of the medial wall of the maxillary sinus (Figures 10–14).

In imaging of the anterior wall of the maxillary sinus, a slightly worse sensitivity (of 0.928571) was revealed by 2D reconstruction. The three-dimensional reconstruction had only a slightly worse sensitivity in imaging of bone chips in the superior orbital wall than the 2D reconstruction (sensitivity of 0.916667) (Tables 8–15).

### Discussion

In the evaluation of the fracture fissures, 2D reconstructions in the sagittal plane were the most successful, for most of the locations. Results obtained in this way provided us with more diagnostic data than transverse or 3D reconstructions. This was especially true for fractures of the lamina within the inferior orbital wall and the superior wall of the maxillary sinus. This follows from the fact that these structures are located and run in the transverse plane, parallelly to the examined plane. As a result, the shadows of bone structures of the examined area and adjacent regions overlap. This produces a false image and thus makes it difficult to diagnose. However, in a wider context, transverse imaging is useful as a method of visualisation of anatomical elements perpendicular to the examined plane. A good example would be the evaluation of anterior and lateral walls of the maxillary sinus and orbital bones. The above mentioned limitations and possibilities of the modern imaging methods were reported by Hoeffner et al. [20] and Sanderow et al. [21]. The results obtained in this

### Table 3. Number of fractures in maxillary sinuses observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p       |
|-------------------|--------------|---------|
|                   | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Anterior wall     | 67 | 78 | 72 | <0.05 | <0.05 | NS     |
| Lateral wall      | 51 | 55 | 15 | NS     | <0.05 | <0.05 |
| Superior wall     | 25 | 64 | 29 | <0.05 | NS     | <0.05 |
| Medial wall       | 11 | 29 | 0  | NS     | <0.05 | <0.05 |

### Table 4. Number of fractures in maxillary bones observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p       |
|-------------------|--------------|---------|
|                   | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Maxillary bone    | 8  | 18 | 16 | <0.05 | <0.05 | NS     |

### Table 5. Number of fractures in nasal bones observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p       |
|-------------------|--------------|---------|
|                   | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Nasal bone        | 54 | 63 | 58 | <0.05 | NS     | NS     |

### Table 6. Number of fractures in zygomatic arches observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p       |
|-------------------|--------------|---------|
|                   | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Zygomatic arch    | 40 | 43 | 42 | NS     | NS     | NS     |

### Table 7. Number of fractures in mandible observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p       |
|-------------------|--------------|---------|
|                   | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
| Condylar process  | 5  | 7  | 5  | NS     | NS     | NS     |
| Body and branches | 16 | 23 | 19 | <0.05  | NS     | NS     |
study are in accordance with observations made by those authors.

In the article by Olszycki et al. [22], special attention was paid to the meaning of 3D reconstructions in imaging of the lower orbital wall. The authors concluded that according to their studies, a useful and successful method of imaging of injury-related sequelae of this region was the 3D reconstruction.

In our work, the highest sensitivity in diagnosing fractures of the inferior orbital wall was revealed by 2D reconstructions. It was noted that in imaging of thin and delicate bone structures (such as cribiform plate of the ethmoid bone, orbital floor, and in some cases also the anterior wall of the maxillary sinus, 3D reconstructions are less useful than 2D reconstructions. The use of 3D reconstructions in these areas often produces false images suggestive of inexistent holes, that are difficult or impossible to differentiate from fracture fissures.
| Location          | Presentation | p  |
|-------------------|--------------|----|
| Medial wall       | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
|                   | 8  | 12 | 3  | NS      | NS      | p<0.05  |
| Lateral wall      | 9  | 14 | 13 | p<0.05  | NS      | NS      |
| Superior wall     | 4  | 10 | 10 | p<0.05  | p<0.05  | NS      |
| Inferior wall     | 9  | 21 | 5  | p<0.05  | NS      | p<0.05  |

Table 8. Number of fracture fragments in orbital walls observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p  |
|-------------------|--------------|----|
| Anterior wall     | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
|                   | 18 | 25 | 26 | p<0.05 | p<0.05 | NS      |
| Posterior wall    | 3  | 3  | 1  | NS      | NS      | NS      |

Table 9. Number of fracture fragments in frontal sinuses observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p  |
|-------------------|--------------|----|
| Anterior wall     | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
|                   | 24 | 25 | 25 | NS      | NS      | NS      |
| Lateral wall      | 23 | 23 | 21 | NS      | NS      | NS      |
| Superior wall     | 9  | 21 | 5  | p<0.05  | NS      | p<0.05  |
| Medial wall       | 6  | 6  | 0  | NS      | p<0.05  | p<0.05  |

Table 10. Number of fracture fragments in maxillary sinuses observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p  |
|-------------------|--------------|----|
| Condylar process  | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
|                   | 6  | 9  | 11 | NS      | p<0.05 | NS      |
| Body and branches | 8  | 9  | 12 | NS      | NS      | NS      |

Table 11. Number of fracture fragments in mandible observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p  |
|-------------------|--------------|----|
| Zygomatic arch    | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
|                   | 14 | 17 | 21 | NS      | p<0.05 | NS      |

Table 12. Number of fracture fragments in zygomatic arch observed in different methods of reconstruction. Statistical significance.

| Location          | Presentation | p  |
|-------------------|--------------|----|
| Nasal bone        | TP | 2D | 3D | TP: 2D | TP: 3D | 2D: 3D |
|                   | 20 | 25 | 35 | NS      | p<0.05 | p<0.05  |
Three-dimensional reconstructions turned out to be of little usefulness not only in the above discussed group of symptoms, but also in imaging of the ethmoid bones. However, it was successful in visualising free bone chips within the condylar process, branches and body of the mandible, anterior wall of the frontal sinus, zygomatic arch, zygomatic bones, and nasal bones. It proved useful in imaging of ‘tripod fractures’.

The technique of 3D reconstruction turned out to be useful also in the evaluation of fractures, with a high number and extent of dislocations of bone chips. This was confirmed by other authors [22,23,26–30]. From among all applied techniques of presentation and reconstruction of CT images, the 3D option (as no other) allows for a very precise reconstruction of post-traumatic anatomical relations. Neither the transverse, nor the multiplanar reconstructions provided sufficient diagnostic information, on the basis of which it would be possible to e.g. study the outlines of all bone chips. From the practical point of view, evaluation of a high number of post-traumatic lesions in one case – which frequently happens – with the use of both mentioned techniques turned out to be labour-intensive and time-consuming, and sometimes even impossible to conduct (when the 3D reconstruction provides synthetic data from nearly the whole examined area, in a short time) [22,27,28,30]. The three-dimensional reconstruction allows also for reliable measurements of distances and direction of dislocations of the fractured bones. Within this respect, the results of our work remain in accordance with observations made by Landowski et al. [27] and Pogorzelska-Stronczak [28].

All methods presented in this work revealed a similar effectiveness in visualising fractured fragments of bones within the posterior wall of the frontal sinus and the lateral wall of the maxillary sinus.

**Conclusions**

In the evaluation of the fracture fissures (especially within the lower orbital wall), multiplanar reconstructions increase the diagnostic effectiveness of CT examinations.

Three-dimensional reconstructions are a good complementary technique allowing to locate free bone fragments precisely and to assess the degree of their displacement.

In case of orbital fractures and before an elective surgery, the spiral CT with multiplanar 2D and 3D reconstructions...
should be the examination of choice in the diagnostic process.

CT examination with spiral data acquisition increases patient’s comfort by reducing the examination time, and allows for a proper quality of reconstructions.

In case of symptoms of facial injury in a patient with a suspicion of brain injury subjected to CT with the use of a standard study protocol and sequential technique in transverse plane, it should be remembered that this diagnostic method does not allow for a precise evaluation of post-traumatic lesions of the facial bones.

It then becomes necessary to extend the diagnostics and use the above presented principles or – depending on the patient’s general health state and previous decisions on further clinical management – to make a note of the presence of facial post-traumatic lesions and refer the patient for an additional examination, in due time.

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