TREATMENT OF PUBIC DISJUNCTION IN YOUNG-BURGUESS TYPE II AND III PELVIC RING FRACTURES

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TREATMENT OF PUBIC DISJUNCTION IN YOUNG-BURGUESS TYPE II AND III PELVIC RING FRACTURES (Abstract). **Aim:** To present the personal experience in assessing the treatment of pubic disjunction in Young-Burguess type II and III pelvic ring fractures. **Material and methods:** Included in the study were 30 patients with type II and III pelvic ring fractures, aged 32 to 76 years. Of these, 18 patients were treated with external fixation, and 12 patients were treated surgically: type II fractures were treated with open reduction and internal fixation (ORIF) of pubic disjunction and type III fractures underwent additionally posterior fixation. **Results:** Mean follow-up was 1.6 years. After external fixation we found the persistence of diastasis (1.5 to 4 cm), which was asymptomatic in all cases. Complications included implant failure in 3 patients, and postoperative infection in 2 patients. Among the 5 patients with type II lesions the clinical and radiological scores were excellent in 3, good in 1, and poor in 1. Among the patients with type III lesions the clinical outcomes were excellent in 5 and good in 2. **Conclusions:** External fixation has proved a good treatment option for patients who cannot tolerate a more extensive surgery. There is no conclusive clinical evidence favoring the use of two perpendicular plates vs. 1 plate for pubic symphysis fixation. In osteoporotic patients the use of 2 plates is recommended. **Keywords:** PELVIC RING FRACTURE, PUBIC DISJUNCTION, ORIF.

Pubic disjunction result from high-energy trauma, and occurs in 14 - 20% of pelvic ring fractures (1). They are frequently associated with multiple other lesions, such as blood vessels rupture with massive hemorrhage, this association having a mortality rate of approximately 15-35% (1, 2). The major sources of bleeding are supposed to be the presacral and retroperitoneal blood vessels. (1).

The conservative treatment of these fractures has proved ineffective. An early firm stabilization and anatomic reduction are recommended to decrease mortality and allow early mobilization (3).

To stabilize these fractures several methods are available. External fixators can be used for the temporary stabilization of all types of pelvic ring fractures or for a definitive one in some cases. Anterior internal fixation can be used as a definitive treatment for pubic disjunctions if the sacroiliac ligaments are intact. Anterior internal fixation may be associated with posterior fixation in patients with posterior pelvic ring injuries (especially in APC type
III) to improve overall stability (4).

**MATERIAL AND METHODS**

In the interval 2008-2014 in the orthopedics and traumatology units of the Iasi "Sf. Spiridon" Emergency County Hospital and Botosani "Mavromati" Emergency County Hospital 30 patients with type II and III pelvic ring fractures, aged between 32 and 81 years (mean age 55 years) were treated. The mechanisms of fracture were: motor vehicle accidents (17: 56.66%), falls from height (10: 33.33%) and 3 (10%) by crush injury (3). The injuries most commonly associated with these fractures were: head trauma, craniofacial trauma, thoracoabdominal trauma, splenic rupture, bladder rupture, lower leg fracture, forearm fracture, fractured clavicle and humerus.

Eighteen patients were treated with external fixation (fig. 1) and 12 patients were treated surgically: type II fractures were treated with ORIF of pubic disjunction and type III fractures underwent additionally posterior fixation. Pubic disjunctions in type II lesions were fixed with one 3.5 mm reconstruction plate and 4 screws (2 cases/16.6%) and with two perpendicular plates (3 cases/25%); those in type III lesions were treated with one 3.5 mm reconstruction plate and 4 screws (3 cases/25%) and two 3.5 mm reconstruction plates (4 cases/33.33%) (fig. 2).

![Fig. 1](image-url)  
**Fig. 1.** – patient B.I., 49 years old, victim of motor vehicle accident. A – preoperative X ray – APC type III injury, B – intraoperative view – posterior stabilization with „C clamp” and anterior with supraacetabular external fixation.
Fig. 2. – patient L.M., 55 years old, victim of motor vehicle accident. A – preoperative X ray – APC type III injury, B – 3D image - APC type III injury, C–postoperative anterior X ray – fixation with 1 plate posteriorly and 2 plates anteriorly, D– postoperative "outlet" X ray – fixation with 1 plate posteriorly and 2 plates anteriorly

RESULTS
Mean follow-up was 1.6 years. The radiologic score and Majeed clinical score were used to assess the outcomes. After external fixation we found the persistence of diastasis (1.5 to 4 cm), which was asymptomatic in all cases (tab.I, II).

<table>
<thead>
<tr>
<th>RESULT</th>
<th>RESIDUAL DISPLACEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0-5 mm</td>
</tr>
<tr>
<td>Good</td>
<td>6-10 mm</td>
</tr>
<tr>
<td>Fair</td>
<td>11-15 mm</td>
</tr>
<tr>
<td>Poor</td>
<td>&gt;15 mm</td>
</tr>
</tbody>
</table>

TABLE II
Interpretation of the clinical score

<table>
<thead>
<tr>
<th>RESULT</th>
<th>TOTAL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>78-80</td>
</tr>
<tr>
<td>Good</td>
<td>70-77</td>
</tr>
<tr>
<td>Fair</td>
<td>60-69</td>
</tr>
<tr>
<td>Poor</td>
<td>&lt;60</td>
</tr>
</tbody>
</table>

Among the 12 patients treated surgically (ORIF) the complications included construct failure (3:25%) (fig. 3) and postoperative infection (2:16.6%). In the 5 (41,66%) patients with type II lesions, clinical scores were excellent in 3 cases (60%), good in 1 (20%) and poor in 1 (20%).
Treatment of pubic disjunction in Young-Burguess type II and III pelvic ring fractures

Fig. 3. – patient M.E., 76 years old, victim of motor vehicle accident. A – preoperative X ray – APC type II injury, B – postoperative "inlet" view – fixation with 2 plates anteriorly, C – X ray on postoperative day 7 – loss of reduction, D – postoperative X ray – stabilization with external fixator.

Radiological scores were excellent in 3 (60%) cases, good in 1 (20%), and poor in 1 (20%). Of the patients with type III injuries 5 (71.43%) had excellent clinical outcomes and 2 (28.57%) good. X-ray results were similar to those in type II injuries (tab. III).

**TABLE III**
Profile of the patients treated surgically by open reduction and internal fixation.

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Injury type</th>
<th>Mechanism</th>
<th>Fixation</th>
<th>Radiologic score</th>
<th>Clinical score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
<td>APC II</td>
<td>Vehicle accident [passenger]</td>
<td>Anterior [1 plate]</td>
<td>8 mm</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>48</td>
<td>APC II</td>
<td>Vehicle accident [passenger]</td>
<td>Anterior [1 plate]</td>
<td>5 mm</td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td>34</td>
<td>APC II</td>
<td>Vehicle accident [passenger]</td>
<td>Anterior [2 plates]</td>
<td>4 mm</td>
<td>77</td>
</tr>
<tr>
<td>8</td>
<td>38</td>
<td>APC II</td>
<td>Vehicle accident [motorcyclist]</td>
<td>Anterior [2 plates]</td>
<td>5 mm</td>
<td>78</td>
</tr>
<tr>
<td>11</td>
<td>76</td>
<td>APC II</td>
<td>Vehicle accident [pedestrian]</td>
<td>Anterior [2 plates]</td>
<td>36 mm</td>
<td>56</td>
</tr>
<tr>
<td>12</td>
<td>36</td>
<td>APC III [ligament injury]</td>
<td>Fall from height</td>
<td>Anterior [2 plates] + Posterior [1 screw]</td>
<td>5 mm</td>
<td>78</td>
</tr>
</tbody>
</table>
DISCUSSIONS

With the progress made in the emergency care system, prompt diagnosis, resuscitation methods, better management of visceral lesions and improved imaging techniques, the orthopedic surgeon plays a key role in the treatment of these patients (3).

In cases of stable fractures without disjunction and stable ligamentous structures a conservative treatment is accepted with good outcomes. Unstable lesions usually require surgical treatment of the anterior and posterior ring, if the latter is injured (4).

In our study external fixation proved to be a good treatment option for patients who cannot tolerate a more extensive surgery.

Management of APC type II pelvic ring fractures with external fixation is effective, relatively simple, minimally invasive, with less intraoperative blood loss and shorter surgical time and allows earlier patient mobilization (5).

A retrospective study of 64 supraacetabular external fixators to stabilize anterior pelvic ring showed iatrogenic lesion of the lateral femoral cutaneous nerve (4.5%) which reversed within 1 year, no pin site infection, no secondary displacements, perforation of the pin into the small pelvis requiring no treatment in 3% of cases, and pseudoarthrosis of the pubic and ischial rami requiring surgical treatment in 1 case (6). The temporary use of an external fixator is safe and effective, but its use for a definitive treatment is associated with high infection rate and secondary displacements according to the study conducted by Mason (7). Galois L (8) says that anterior inferior placement of the external fixator showed a potential for increased stability.

Pubic disjunctions > 2.5 cm reflect rotational instability and benefit from anterior stabilization, internal fixation being preferred to external fixation. There is no universally accepted protocol on the type of plate (dynamic compression plate vs. pelvic reconstruction plate), plate thickness (3.4 vs. 4.5 mm) or number of plate screws. There is conflicting evidence on the benefits or need to use a 2-hole plate. It has been agreed that additional posterior instability requires a surgical posterior stabilization procedure (4).

In our surgically treated patients we thought that in case of APC type III injuries anterior and posterior stabilization is mandatory. As to the stabilization of pubic disjunction, no differences between the number of used plates (1 plate vs 2 plates) and clinical and radiological scores were found. However, it is worth mentioning that in osteoporotic patients using a single plate does not provide a satisfactory stabilization.

Initially based on biomechanical studies it was considered that adding a second plate can lead to better stabilization, theoretically being indicated in unstable fractures (9).

In a retrospective study Bagchi K. (4) found no conclusive evidence favoring the use of two plates versus one plate to stabilize the pubic symphysis. Several clinical and biomechanical studies describe the use of a single plate as appropriate for all types of pelvic ring fractures.

Although plate fixation of pubic disjunctions is the recommended treatment, the incidence and consequences of fixation failure remained a concern. Some of these are due to osteosynthesis material failure and low bone density. However, these do not seem to affect the clinical outcome, because few patients require surgical reinsertion (2).
A study evaluating locked versus non-locked plate osteosynthesis of the pubic symphysis showed that locked plates together with the required screws have no advantage over non-locked plates, but further studies are needed (10). On the other hand, Pizanis (11) suggested a biomechanical advantage in using anatomically contoured plates with locking screw capabilities in case of large displacement or obese patients. A biomechanical cadaveric study conducted in 2013 revealed that locked plate osteosynthesis at the pubic symphysis has no advantage over non-locked plates (12).

Lange (13) compared osteosynthesis with a two-hole anterior plate versus two plates (one superior and the other anterior) for pubic disjunction. Double plate osteosynthesis offers a more rigid fixation, but the procedure requires extensive dissection which may cause a significant loss of blood. Single plate osteosynthesis is less rigid and helps accommodate the normal movement of the pubic symphysis without loss of reduction and with a limited dissection.

Simonian (14) and Dujardin (15) in their studies concluded that osteosynthesis of the anterior and posterior pelvic ring is optimal for APC II and III injuries as compared to single plate anterior pelvic ring fixation.

**CONCLUSIONS**

The results of this study allow us to state that external fixation has proved a good treatment option in patients who cannot tolerate a more extensive surgery. There is no conclusive clinical evidence favoring the use of two perpendicular plates vs. 1 plate for pubic symphysis fixation; in osteoporotic patients the use of 2 plates is indicated regardless of lesion type. A residual diastasis below 1 cm is accompanied by good clinical outcomes.

**REFERENCES**


**HEART RATE VARIABILITY IN OVERWEIGHT HEALTH CARE STUDENTS: CORRELATION WITH VISCERAL FAT**

Overweight and obesity are due to abnormal or excessive fat accumulation that may impair health and it is because of an imbalance between calories consumed and expended. The global epidemic of overweight and obesity is the major public health problem in developed as well as developing world. Abdominal obesity, defined as increased waist circumference is one of the components of the constellation of metabolic abnormalities collectively called as the metabolic syndrome (MS). The latest definition of MS by the International Diabetes Federation (IDF) has included abdominal obesity as one of the essential components. Among the different available non-invasive techniques for assessing the autonomic status, Heart Rate Variability (HRV) is a simple method to evaluate the sympathovagal balance at the sinoatrial level. Increased sympathetic activity, decreased parasympathetic activity and sympathetic imbalance (SVI) has been reported in obese individuals. However, the SVI and its association with visceral fat in overweight health care students have not been explored. Therefore, in the present study, was observed the sympathovagal imbalance due to increased sympathetic activity and its association with visceral fat in overweight individuals (Chintala KK, Krishna BH, Reddy MN. Heart Rate Variability in Overweight Health Care Students: Correlation with Visceral Fat. *Journal of Clinical and Diagnostic Research*. 2015, Vol-9(1): 6-8).