

# Functional Status of Hip Joint after Surgical and Conservative Treatment of Acetabular Fracture

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## ABSTRACT

*Both conservative and surgical treatment of acetabular fractures alter biomechanical conditions in the hip joint resulting in various degenerative changes in the acetabulum and the femur head. These changes may progress to secondary coxarthrosis, causing dysfunction of the hip joint. The aim of this paper is to compare the outcomes of both conservative and surgical treatments in different types of acetabular fractures, so that clear indications for either conservative or surgical treatment could be determined. This paper is based on retrospective study of 103 patients with acetabular fracture (21 surgically treated and 82 conservatively treated). In this study the incidence of particular types of acetabulum fractures, the treatment period, the incidence of complications and the functional status of the hip after the treatment were analyzed. In patients with anterior fracture surgical treatment lasted three times less than conservative treatment and resulted in far better functional status of the hip joint compared to conservatively treated patients. However, in patients with transverse fractures the functional status was better and the treatment period shorter after the conservative treatment. We believe that the present treatment indications should be corrected so that in anterior column fracture the surgical method should be preferred, whereas the transverse fracture should be treated conservatively. In other types of acetabular fracture, with the radiographic roof arc angle of 45° or less, the surgical method should be preferred to conservative method.*

**Key words:** hip, acetabulum, acetabular fracture I

## Introduction

Degenerative changes of the hip joint are rather frequent and they represent a treatment challenge in spite of the advanced surgery and orthopedics. Both conservative and surgical treatment of acetabular fractures alter biomechanical conditions in the hip joint resulting in various degenerative changes in the acetabulum and the femur head<sup>1-3</sup>. These changes may progress to secondary coxarthrosis, causing (morphological and functional) dysfunction of the hip joint. These changes can be normotrophic, hypertrophic or atrophic. The hypertrophic changes occur most frequently<sup>4</sup>.

The patterns of acetabular fractures depend on direction of the force exerted on the acetabulum. There are two kinds of forces that cause acetabular fractures: the force exerted on the greater trochanter and the femur neck, where the pattern of the acetabular fracture de-

pends on abduction, adduction and femur rotation degree and axial force directed to baseline and diaphysis of the femur, where the fracture pattern depends on the flexion degree. According to suggested acetabular fracture classification, which combines the pelvic integrity and biomechanics of fracture in one clinical issue, the acetabular fractures (Figures 1 and 2) could be divided into simple and concomitant fractures<sup>6</sup>.

The mentioned classification of acetabular fractures with smaller modifications in order to meet A, B, C as well as AO classification criteria is widely used in the centers where acetabular fractures are treated.<sup>7</sup> Modern diagnostic and surgical procedures applied in acetabular fractures treatment should postpone the expected development of the coxarthrosis, arthroplasty and consequential complications<sup>8</sup>.

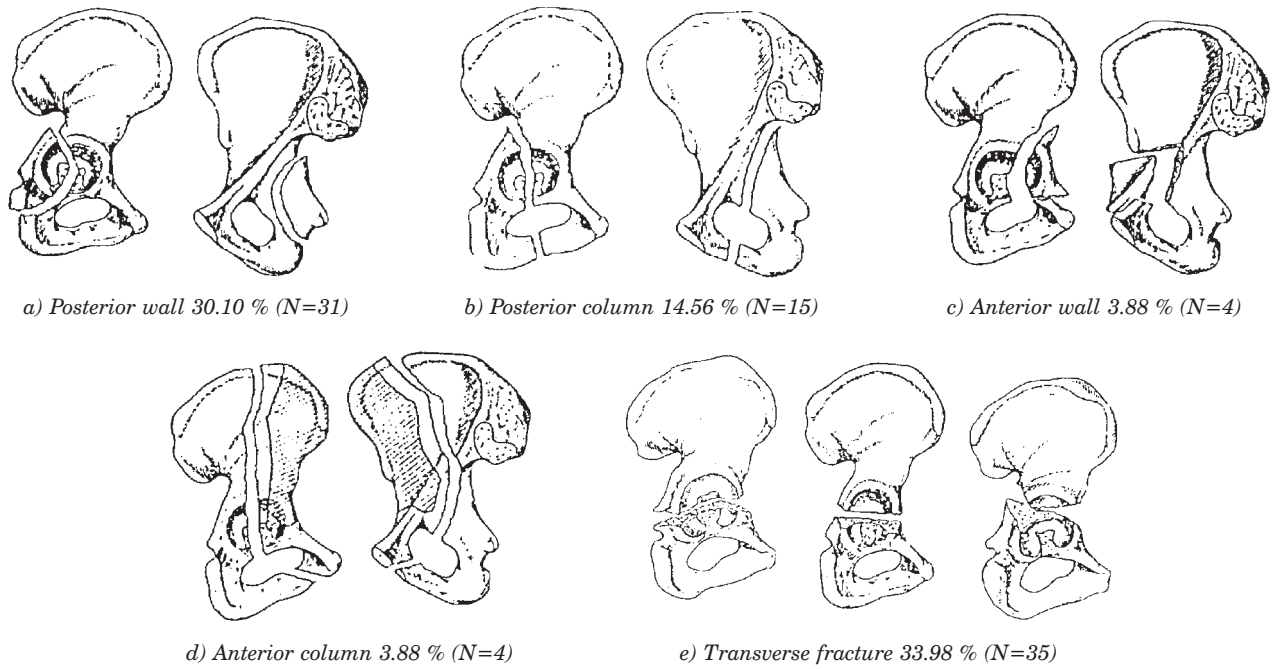


Fig. 1. Distribution of simple acetabular fractures in the examinees.

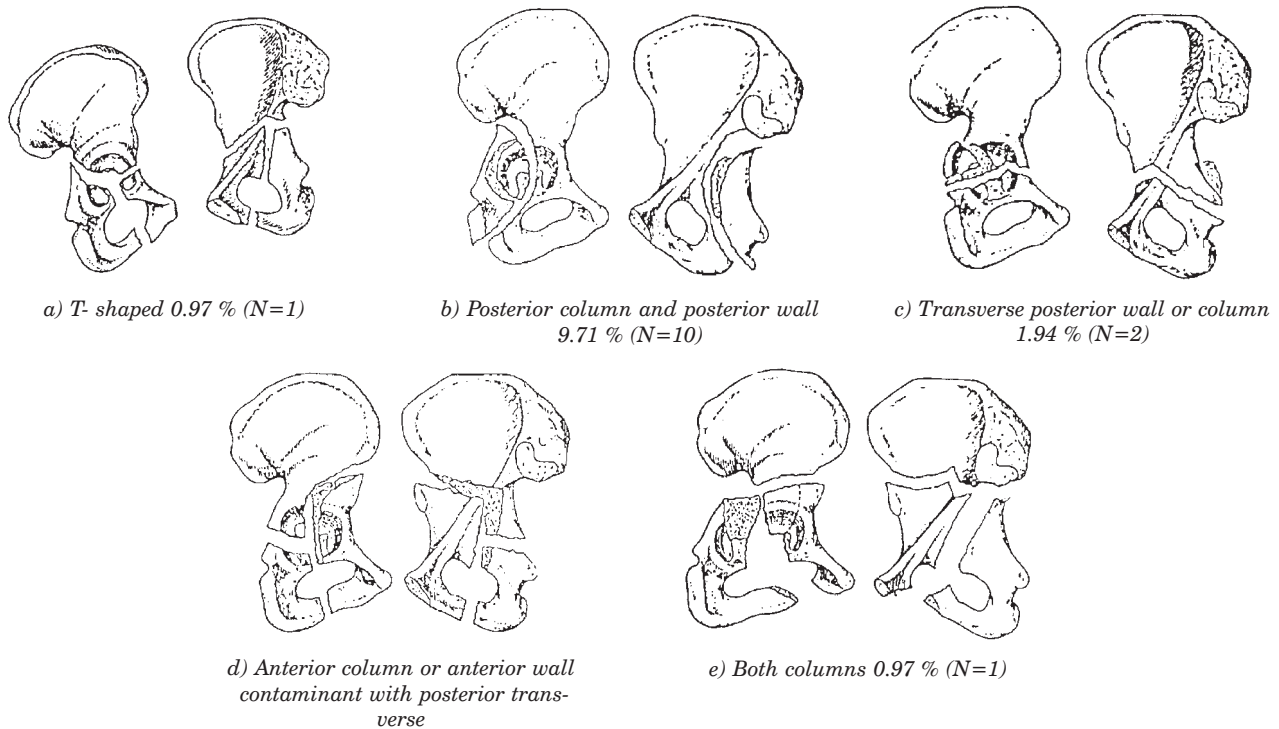


Fig. 2. Distribution of concomitant acetabular fractures in the examinees.

The aim of this paper is to compare the outcomes of both conservative and surgical treatments of different types of acetabular fractures so that clear indications for either conservative or surgical treatment could be determined.

## Material and Methods

This paper is based on the retrospective study of 103 patients (79 men and 24 women) treated at the Surgical department of Clinical Hospital Osijek during a 6 year

period (from January 1993 to January 1999). The patients' age varied from 15 to 90 with the mean age of 43,65. Radiographic evaluation of the acetabular fracture was geometrically analyzed for every patient. The vertical line was drawn through the geometrical center of the remaining acetabulum roof and the other line was drawn from the fracture site on the roof to the geometrical center. The angle between these two lines represents the roof arc. With the roof arc angle of more than 45° in all radiographs, the conservative treatment is preferred<sup>9</sup>, but with the roof arc angle of less than 45° the surgical treatment was a method of choice.

The incidence of particular acetabular fractures, the treatment period, the incidence of complications and the functional status of the hip after the treatment were analyzed. The functional status of the hip was assessed according to abduction and anteflexion, comparing its status with mobility range of the healthy hip. After the treatment the comparative analysis of abduction and anteflexion was done for every type of the acetabular fracture. Also, the functional status of the hip joint after the acetabular fracture in patients treated conservatively was compared to surgically treated patients.

## Results

According to radiographic evaluation of acetabular fractures, they can be classified into two groups: simple and concomitant fractures<sup>10</sup>. Simple fractures occurred in 87 patients (84.47%) and concomitant fractures in 16 patients (15.53%). Figures 1 and 2 show the distribution of acetabular fractures according to their location. Transverse fractures had the highest incidence (35 cases or 33.9%), followed by posterior wall fractures (31 case or 30.10%).

After diagnostic and geometrical analysis of acetabular fractures we could decide upon the treatment. 21 out of 103 acetabular fractures (20.38%) were surgically treated and 82 (79.62%) conservatively. Three methods were used in conservative treatment: traction, combination of traction and cast immobilization and rest, whereas in surgical treatment we used osteosynthesis with screws, combination of screws and plates and osteosynthesis with plates (Table 1). 31 patients developed

**TABLE 1**  
INCIDENCE IN CONSERVATIVE AND SURGICALLY TREATED METHODS OF ACETABULAR FRACTURE

|                        | The method of choice                            | N  |
|------------------------|---|----|
| Conservative<br>(N=82) | traction  | 42 |
|                        | combination of traction and cast immobilization | 10 |
|                        | rest  | 30 |
| Surgical<br>(N=21)     | osteosynthesis with screws                      | 18 |
|                        | combination of screws and plates                | 1  |
|                        | osteosynthesis with plates                      | 2  |

complications during the treatment (27 were treated conservatively and 4 surgically) (Table 2). Phlebotrombosis, the complication with the highest incidence, occurred more often in conservatively treated patients ( $p < 0.05$ ). Table 3 shows the chosen treatment method according to the type of acetabular fracture (AF) and the treatment period. Conservative treatment lasted on average longer than surgical. Functional analysis of the hip joint was used to determine the degree of anteflexion and abduction for every acetabulum fracture type after the treatment and it is presented in Figures 3 and 4. In anterior acetabular fractures the degree of anteflexion and abduction of the hip joint was significantly greater after surgical treatment in comparison to the same parameters in acetabular fractures treated conservatively. However, in transverse fractures the functional status of the hip joint was much better after conservative treatment.

## Discussion

The aim of this study was to evaluate currently used indicators for conservative or surgical treatment of acetabular fractures and to suggest new indicators for treatment choice in different types of acetabulum fractures. The study sample was homogenous regarding sex and age and all acetabular fracture types were included.

The chosen treatment method was based on anthropometric analysis and it corresponded to the current therapy guidelines<sup>9</sup>. Anthropometric analysis showed that

**TABLE 2**  
THE COMPLICATION INCIDENCE IN SURGICALLY AND CONSERVATIVELY TREATED PATIENTS WITH ACETABULAR FRACTURES

| The method of choice | Number of examinees | Complication type       | Complication incidence % |
|----------------------|---------------------|-------------------------|--------------------------|
| Conservative         | 82                  | Phlebothrombosis        | 20 (24.39 %)             |
|                      |                     | Lung emboli             | 5 (6.10 %)               |
|                      |                     | Redislocation           | 2 (2.44 %)               |
|                      | Total:              | 27 (35.37 %)            |                          |
| Surgical             | 21                  | Injury of Sciatic nerve | 3 (14.29 %)              |
|                      |                     | Phlebothrombosis        | 1 (4.76 %)               |
|                      | Total:              | 4 (19.05 %)             |                          |

**TABLE 3**  
DIFFERENCE IN TREATMENT PERIOD BETWEEN SURGICAL AND CONSERVATIVE TREATMENT METHOD ACCORDING TO ACETABULAR FRACTURE TYPE

| AF type                              | Chosen treatment |        |              |        | Mean treatment period |              |
|--------------------------------------|------------------|--------|--------------|--------|-----------------------|--------------|
|                                      | Surgical         |        | Conservative |        | Surgical              | Conservative |
|                                      | Number           | %      | Number       | %      |                       |              |
| Posterior wall                       | 12               | 57.14  | 19           | 23.17  | 11.86                 | 13.20        |
| Posterior column                     | 4                | 19.05  | 11           | 13.41  | 9.70                  | 12.20        |
| Anterior wall                        | 1                | 4.76   | 3            | 3.66   | 12.95                 | 12.90        |
| Anterior column                      | 1                | 4.76   | 3            | 3.66   | 5.20                  | 15.80        |
| Transverse fracture                  | 1                | 4.76   | 34           | 41.46  | 15.80                 | 12.20        |
| T shaped fracture                    | –                | –      | 1            | 1.22   | –                     | 10.90        |
| Posterior column with posterior wall | 2                | 9.52   | 8            | 9.76   | 10.20                 | 10.25        |
| Transverse and posterior wall        | –                | –      | 2            | 2.44   | –                     | 11.60        |
| Both columns                         | –                | –      | 1            | 1.22   | –                     | 12.86        |
| TOTAL                                | 21               | 100.00 | 82           | 100.00 | 10.95                 | 12.40        |
| SD                                   |                  |        |              |        | 3.17                  | 4.38         |
| Range                                |                  |        |              |        | 4–15                  | 1–26         |

simple acetabular fractures are far more frequent than transverse or posterior wall fractures (Figure 1). During the follow up period the incidence of complications was

twice higher in conservatively treated patients. The most frequent complication was phlebothrombosis. Its development was statistically more significant in conservatively treated patients than in surgically treated patients due to long immobilization period in conservative treatment.

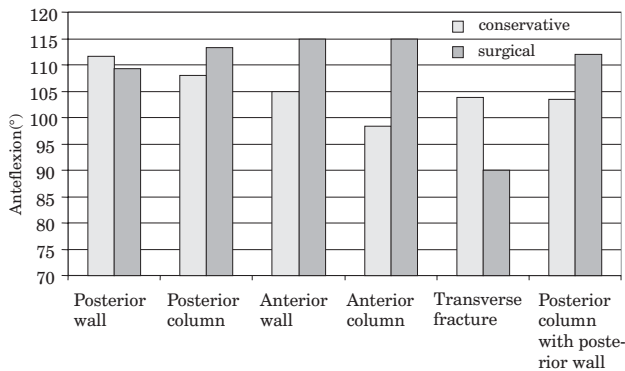


Fig. 3. The range of anteflexion in conservatively and surgically treated patients.

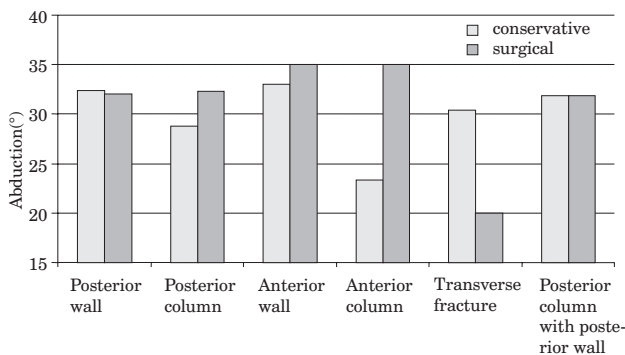


Fig. 4. The range of abduction in conservatively and surgically treated patients.

Post-treatment analysis showed that conservative treatment lasted on average longer than surgical treatment, especially in case of anterior column fractures. The exceptions were transverse fractures, where surgical treatment lasted longer. The outcome of both types of treatment showed that the anteflexion had on average the mobility range of 82.15% in comparison to mobility range of a healthy hip joint and that abduction was on average 68.18%. Since the mobility range of the treated hip joint was not statistically significant in comparison to the healthy hip joint, we believe that we have chosen the right treatment. The functional status of the hip joint after surgical treatment in comparison to conservatively treated fractures was far better in anterior fractures and surgical treatment lasted three times less. However, in transverse fractures the functional status was better after conservative treatment and the treatment period was shorter.

Based on the obtained results we could conclude that surgical and conservative treatments are equally effective methods, providing the same functional status of the fractured hip joint after the treatment, except in case of anterior column fracture and transverse fractures. Nevertheless, the mobility range of the hip joint in conservatively treated patients was increased, but the treatment period was longer and the incidence of complications was higher.

We believe that the current indications should be improved and that in case of anterior column fracture the surgical treatment should be preferred regardless of how

big the intact acetabulum roof is, whereas in case of transverse fractures the conservative treatment is suggested.

In all cases of acetabular fractures where the roof arc angle is less than 45°, surgical treatment should be cho-

sen, since the functional status would be more or less the same, but the treatment period would be shorter and the incidence of complications, especially phlebothrombosis, lower in comparison to conservatively treated patients.

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## FUNKCIONALNI STATUS KUKA NAKON KIRURŠKOG I KONZERVATIVNOG LIJEČENJA PRIJELOMA ACETABULUMA

### SAŽETAK

Zbog promijenjenih biomehaničkih uvjeta nakon konzervativnog ili kirurškog liječenja prijeloma acetabuluma dolazi do brojnih degenerativnih promjena acetabuluma i glave bedrene kosti. Te su promjene posebice izražene u sekundarnoj osteartrozi uzrokujući disfunkciju zgloba kuka. Cilj je ovoga rada usporediti učinke konzervativnog i operacijskog liječenja kod različitih tipova prijeloma acetabuluma te, na osnovu toga, postaviti jasne indikacije za konzervativno i operacijsko liječenje prijeloma acetabuluma. Istraživanje je temeljeno na retrospektivnoj studiji 103 ispitanika s prijelomom acetabuluma (21 kirurški liječeno i 82 operacijski liječeno). Promatrali smo incidenciju pojedinih tipova prijeloma acetabuluma, razdoblje liječenja, pojavnost komplikacija i funkcijski status zgloba nakon liječenja. U slučajevima prednjeg prijeloma acetabuluma kirurško liječenje traje tri puta kraće od konzervativnog i daje bolji funkcijski status. Suprotno je u slučajevima poprečnog prijeloma acetabuluma gdje konzervativno liječenje kraće traje od kirurškog i daje bolji funkcijski status. Vjerujemo da bi sadašnje indikacije stoga trebale biti korigirane te da se u slučajevima prednjeg prijeloma odlučuje za kiruršku metodu, dok bi odabir za poprečni prijelom uvijek trebao biti konzervativan. U preostalih tipova prijeloma, i kada je neozlijeđeni noseći dio krova s krovnom lukom u svim radiološkim prikazima jednak ili nešto veći od 45°, treba preferirati operacijsko liječenje.