THE EFFECT OF SALTER INNOMINATE OSTEOTOMY ON FEMORAL ANTEVERSION IN DEVELOPMENTAL DYSPLASIA OF THE HIP: A PRELIMINARY REPORT

GELİŞİMSEL KALÇA DISPLAZİSİ TEDAVİSİNDE SALTER İNNOVİNAT OSTEOTOMİSİNİN FEMORAL ANTEVERSİYONA ETKİSİ: ERKEN BİLDİRİ

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ABSTRACT

Purpose: To study whether surgical correction of excessive femoral anteverision was necessary or not during Salter innominate osteotomy. Children who had been treated by this operation were followed to determine the changes in femoral anteverision. Methods: Twenty-three developmentally dysplastic hips of one male and fourteen female patients, whose ages ranged from 1.5 to 3.5 years, were treated. During follow-up, the children were evaluated for the changes in the femoral anteverision values after the acetabular redirection operation. The femoral anteverision was measured by using computer tomography preoperatively and one year after surgery. Results: At the end of the first postoperative year, there was a mean decrease of 2.51 degrees (range 0.8 to 9.4°) in femoral anteverision and this decrease was found to be statistically significant (p<0.05). Conclusion: Although Salter innominate osteotomy does not accelerate the decrease of the femoral anteverision values, it allows a similar decrease with the normal hips.

Key Words: Developmental Dysplasia of the Hip, Salter Osteotomy, Femoral Anteverision.

ÖZET

Amaç: Salter innomnatin osteotomisi ile tedavi edilen çocuklarda aşıri femoral anteversonun cerrahisi olarak düzeltmesini genelde gerekmediğini ortaya koymak için bu çalışmada Salter ameliyatı sonrası femoral anteversonun değişikliğini değerlendirildik. Hastaarlar ve Metod: Gelişimşel kalça displazisi nedeniyle cerrahi tedavi uygulanan bir erkek ve 14 kız hastanın 23 displastik kalça bu çalışmaya dahil edildi. Yaşıları 1.5 ile 3.5 arasında değişen hastalara ameliyat öncesi ve sonrası bilgisayarlı tomografi ile femoral anteversonun ölçümü yapıldı. Bulgular: Ameliyat sonrası barınan çocuk femoral anteversonunda 2.51° (-0.8° - 9.4°) lik bir azalma tespit edildi ve bu matematiksel olarak anlamlı bulundu (p<0.05). Sonuç: Salter innomnatin osteotomisi femoral anteversonunun azalması açısından hizlandırılmış bile normal kalçaarda izlenen değer femoral anteversonun azalma sırasını etkilememekteidir.

Anahtar Kelimeler: Gelişimşel Kalça Çıkığı, Salter Osteotomisi, Femoral Anteverson.

INTRODUCTION

Developmental dysplasia of the hip (DDH) is still an important problem and has an incidence of 1.34 percent in Turkey, where inter-relative marriages and the application of traditional swaddling in an extension and adduction position of the hips is common (1).

Salter innominate osteotomy has been an effective treatment method for DDH since it was first described in 1961. According to Salter, the main problem in DDH was malrotation and excess anteverision of the acetabulum. Therefore, he designed an operation that rotated the acetabulum laterally and anteriorly. Salter believed that if malrotation of the acetabulum was corrected, there was no further need to surgically correct the increased femoral anteverision (2-5). However, the degree of femoral anteverision that can be accepted and the timing of the surgical correction are controversial (5).

The purpose of this study was to assess the
changes in femoral anteverision in a group of children with DDH and were surgically treated by Salter innominate osteotomy and to use this as a guide to decide on whether or not it was necessary to correct the femoral anteverision during surgical treatment by Salter osteotomy.

PATIENTS AND METHODS

Between 1995 and 1997, twenty-three hips of fifteen children with DDH were treated by open reduction and Salter innominate osteotomy. Age of the patients ranged from 18 to 42 months. Fourteen of them were female and one of them was male.

The femoral anteverision was determined before and one year after surgical treatment by computer tomography (CT) by using the Hernandez technique. This technique uses the horizontal sections at the suprapatellar region of the femur and the femoral neck region as guides. After taking the horizontal sections, the angle between the femoral neck and the distal axis of the femur are measured and this directly corresponds with the femoral anteverision angle (6, 7) (Fig. 1-A-B and Fig. 2-A-B).

Preoperative and postoperative first year femoral anteverision measurements of twenty-three hips were obtained and compared statistically by using the paired t-test. Then, femoral anteverision values of the seven unilateral cases were obtained simultaneously with the unaffected side. The Wilcoxon test was used to compare the two groups of measurements for the unaffected hip.

All the patients were chosen according to Salter's indications and prerequisites (3-5). After preoperative traction, a standard Salter operation was performed (Fig. 3-A-B.)

RESULTS

Table 1 demonstrates the femoral anteverision measurements taken preoperatively and at the postoperative first year. The mean preoperative femoral anteverision was 35.73 degrees and this was 33.22 degrees at the end of the first postoperative year. This difference was found to be statistically significant (p=0.025).

Femoral anteverision values of unilateral cases, which were obtained simultaneously with the affected side before and after surgery (Table 1.) There were seven such cases and the mean femoral anteverision before treating the affected side was 30.42 degrees which decreased to 28.82 degrees one year after treatment. There was a statistically significant difference between the groups (p=0.043).

DISCUSSION

In a normal individual, femoral anteverision is neutral in the first half of intra-uterine life, increases to thirty to thirty-five degrees at birth and then slowly decreases to the adult value of

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Fig. 1: Tomographic section of the proximal part of the femur. Line 1 on the graph represents the axis of the femoral neck and head (A). Tomographic section of the distal part of the femur at the proximal end of the patella. Line on the graph represents the transverse axis of the femur. Anteverision angle is the difference between these two angles (B).

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ten to fifteen degrees (5, 8, 9). However, patients with DDH have excessive femoral anteversion and valgus and this does not correct itself especially after the patient is three years old, causing a series of problems. Salter innominate osteotomy redirects the acetabulum to obtain a stable hip joint in the functional weight-bearing position. Salter believes that when this is achieved, the proximal femur gains a chance to show normal development. This operative technique is still used successfully by orthopedic surgeons from all over the world (2-5, 10, 11). In spite of Salter’s views, there is controversy on the necessity and timing of surgical correction of excess femoral anteversion (5, 12).

In 1974 Serafinov studied the natural history of femoral anteversion after Salter innominate osteotomy, by using direct radiograms. In that study Serafinov followed fifty hips of thirty-nine patients for two years (13) and used Rippstein-Müller technique (14-16) for measuring femoral anteversion, finding a mean decrease of twenty-two degrees (range eight to thirty-four degrees).
Table 1: Femoral anteversion values measured preoperatively and at the end of the first postoperative year. The underlined numbers represent anteversion measurements taken on the normal hip side of unilateral DDH cases.

<table>
<thead>
<tr>
<th>Case No</th>
<th>Side</th>
<th>Preoperative Femoral Anteversion (Degrees)</th>
<th>Postoperative First Year Femoral Anteversion (Degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>1</td>
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<td>26</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>Right</td>
<td>40</td>
<td>35</td>
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<tr>
<td>3</td>
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<td>37</td>
<td>38.4</td>
</tr>
<tr>
<td>4</td>
<td>Bilateral</td>
<td>35.4</td>
<td>33.2</td>
</tr>
<tr>
<td>5</td>
<td>Right</td>
<td>45.4</td>
<td>24.7</td>
</tr>
<tr>
<td>6</td>
<td>Right</td>
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</tr>
<tr>
<td>7</td>
<td>Bilateral</td>
<td>34</td>
<td>33.4</td>
</tr>
<tr>
<td>8</td>
<td>Right</td>
<td>36.8</td>
<td>28</td>
</tr>
<tr>
<td>9</td>
<td>Bilateral</td>
<td>48</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>Bilateral</td>
<td>43.5</td>
<td>46.7</td>
</tr>
<tr>
<td>11</td>
<td>Bilateral</td>
<td>26</td>
<td>29</td>
</tr>
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<td>12</td>
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<td>15</td>
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<td>15</td>
<td>Left</td>
<td>25</td>
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</tr>
</tbody>
</table>

This method of measurement was rather difficult and later in 1981, Hernandez used CT for measuring femoral anteversion, which was easier and more precise (6, 7, 17-21). In the present study, in order to obtain more reliable data, we used the Hernandez technique to measure femoral anteversion.

Our approach to children with DDH has not included surgical correction of femoral anteversion, even when the anteversion exceeds fifty degrees. Our results in this study have shown that there is a statistically significant decrease in femoral anteversion of the unaffected hips of children with unilateral DDH, which is an expected finding. However, there is a similar decrease in femoral anteversion of the affected hips one year after Salter osteotomy. In our opinion, this shows that femoral anteversion will gradually correct itself and despite the good results of Salter innominata osteotomy, this natural history, was not found to be affected by the osteotomy. Although the follow-up period is short for this study, this is a preliminary report and we expect that this improvement will continue throughout later years. It is perhaps possible to document this further improvement by CT follow-up, but we are not planning such a study because of possible radiological hazards.

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