Importance of Herrings classification in predicting the outcome of aseptic necrosis of the femoral head

Žarko Dašić¹, Miroslav Kezunović¹, Goran Pešić¹, Vesna Bokan², Mira Jovanovski³

¹Clinic for Orthopedics and Traumatology, ²Center for Physical Medicine and Rehabilitation; Clinical Center Podgorica, ³Montenegro Ministry of Health; Podgorica, Montenegro

ABSTRACT

Aim To highlight the importance of values of the Herring’s classification in the treatment planning of Legg-Calve-Perthes disease (LCPD).

Method The charts of 14 patients in a period of 4 years (2004-2008) were retrospectively reviewed. Inclusion criteria was unilateral LCPD and contralateral healthy hip. The patients were divided into three Herring groups according to radiographic images (A, B and C). For all patients the acetabulum/head index (AHI) was determined.

Results The youngest patient was 4.9 years and the oldest 9.11 years; male patients were dominant (male:female 11:3). The right hip side was more affected comparing to the left one (8:6). The distribution of patients in Herring groups was three in the Group A, six in the Group B and five patients in the Group C. The AHI index was lowest in the group C. Patients in the group C were treated surgically.

Conclusion Herrings classification predicts patients with extensive changes and suggests what kind of treatment should be applied.

Key words: Perthes disease, Herring’s classification, treatment
INTRODUCTION

Since Legg-Calve-Perthes-disease (LCPD) is a chronic disease, it has a characteristic cyclic flow. Perthes disease is not only an aseptic necrosis of the bone, but also subchondral fracture, which leads to deformities of the head and neck of the femur (1,2). The disease occurs in three pathological stages: the initial stage, the stage of fragmentation and the reparation stage. Definite changes in the proximal femur in this disease depend on several factors that influence the course of the disease (3). Out of these, the most important are patient age, degree of involvement of the epiphysis, sex, containment of the head within the acetabulum, premature closure of the growth zones, changes in the metaphysis, increased body weight and prolonged restriction of movement in the hip (1,3,4).

Deformity that occurred as final outcome of the LCPD caused altered morphology of the hip and related conditions for the emergence of early degenerative hip changes (osteoarthritis).

A significant number of methods (2,3,5,6) for evaluating the results of LCPD treatment are described: Heyman and Herndon (calculated epiphysis index, head and neck index, acetabulum index and acetabulum-head index), Mose (estimated AP and lateral radiographs, which are made in Lowenstein’s position), Catterell’s classification in 4 stages and one of the last modern classifications by Herring which consists in determining the side (lateral) collapse of the epiphysis in the process of fragmentation of the containment of the head within the acetabulum in the final stage of the disease.

According to Stolberg, there are three types of congruency between the femoral head and the acetabulum: spherical congruency, non-spherical congruence and non-spherical incongruence (7-10). Spherical congruence does not cause degenerative changes; non-spherical congruence leads to degenerative changes at a later age, and non-spherical incongruence to early degenerative changes in the hip joint, before the end of the fifth decade (11). Montenegro is an area with disorders of the hip joint during childhood, highly represented. Good diagnosis and adequate treatment are conditions for full functional recovery. The importance of Herring classification has not been studied in this area and this study can serve as a further contribution to clinical practice.

The aim of this study was to highlight the importance of Herring’s classification values in the treatment planning and outcome of Legg-Calve-Perthes disease.

PATIENTS AND METHODS

A retrospective analysis of X-ray images in 14 patients treated at the Clinic for Orthopedics and Traumatology of the Clinical Center Podgorica, Montenegro, in the period from 2004 to 2008 was conducted. All patients had unilateral occurrence of the LCPD and all patients were at the stage of complete restitution of the disease. X-rays of the pelvis at the final stage of the fragmentation of the disease with definite changes in the proximal femur were analyzed. Inclusion criteria were healthy contra lateral hip as healthy material for comparison.

Image analysis of the fragmentation phase included a division and definition of the three pillars of the femoral head; the determination of the collapse degree of the lateral pillar (determined by measuring the distance h (the distance between the epiphysis cracks and the highest point of the epiphysis in the lateral column). This distance was determined in both: the diseased and the healthy opposite hip, and it was expressed in mm.

According to Herring’s classification (12,13) patients were divided into 3 groups. In the Group A (Herring A) lateral pillar height of the affected hip was identical with the height of the lateral pillar of the healthy hip, in the Group B (Herring B) lateral pillar of the affected hip reached a height of more than 50% of the healthy hip, and in the G group C (Herring C) the height of the lateral pillar of the affected hip was less than 50% of the height of the lateral pillar of the healthy hip.

Evaluation of the head containment within the acetabulum was performed by determining the acetabulum/head index (AHI) and the Heyman-Herndon index: the ratio between horizontal diameters of the head covered by acetabulum and horizontal diameter of the head.

The study was approved by the Ethics Committee of the Clinic for Orthopedics and Traumatology, Clinical Center Podgorica.

RESULTS

From the total number of 14 patients, three (21.42%) were females and 11 (78.58%) were
males. The youngest patient was 4.9 and the oldest one was 9.11 years of age (Table 1).

According to the localization of the LCPD the right hip dominated in eight (57.14 %) patients. The highest number of patients with LCPD were in the age group 6-8 years, eight patients (57.14%), while the smallest representation of LCPD was in the age group of 5 years, one patient (7.14%) (Table 1).

**DISCUSSION**

For the disease evaluation and treatment planning examination (14), the presence of (containment) of the femoral head within the acetabulum is an important factor. Calculation and determination of AHI (acetabulum-head-Herndon Hayman index) derives from the need to timely detect and assess risk patients, in order to plan their treatment and to start it on time (15,16). Treatment started timely avoids the risk of pronounced changes in the proximal femur, and thus significantly reduces non-spherical incongruence (17).

Measurement of the epiphyseal collapse of the diseased hip in the studied patients showed significant differences compared with measurements of the same parameter of the healthy hip in all three groups classified according to Herring. Park et al. (18) suggested highest reliability of the Herring classification stating that patients who are older than 8 years and belong to group A, may be considered for surgical treatment. In our study, group A (three males) with AHI of 0.8 were treated conservatively. The results of this study showed that the AHI in patients’ decreased from group A to group C, and that the containment of the femur head was smallest when the degree of the epiphysis collapse was higher.

In group B there were six patients with AHI index 0.7, and in group C five patients had AHI index 0.6. This difference between groups suggests that the Herrings classification in predicting the outcome of treatment of LCPD has a basis, since the group (group A) patients with AHI index 0.8 had the smallest changes in the lateral column of the fragmentation stage and that in group (group C) patients with AHI index 0.6, changes were biggest. Patients from group C were treated as high-risk patients and an active surgical treatment was engaged for them to achieve good results. In the prospective multicenter Herring et al. study (17) the lateral pillar classification and age of onset of the disease strongly correlated with the outcome of the treatment of LCPD. Patients in groups B and C had a better outcome with operative treatment and the age of eight years. In our study, according to the age of disease onset, more than half of the patients were in the group 6-8 years, which correlates with the results of Herring (17). Recent studies

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**Table 1. Patients with Legg-Calve-Perthes disease (LCPD) according to sex, localization and age distribution**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Gender</th>
<th>Side</th>
<th>Age distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Left</td>
<td>0-5</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4(28.57)</td>
<td>(50.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6(42.85)</td>
<td>(57.15)</td>
</tr>
</tbody>
</table>

The largest representation of LCDP was in males on the right hip at the age of 6-8 years.

According to the Herring classification in the group A there were three (21.43%) patients, in group B six (42.86%) and in group C five (35.71%) patients; gender distribution was approximately uniform, A: B: C for males was 3: 4: 4 (Table 2).

**Table 2. Distribution of patients according to Herring groups**

<table>
<thead>
<tr>
<th>Herrings classification Group</th>
<th>No (%) of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3 (21.43)</td>
</tr>
<tr>
<td>B</td>
<td>4 (28.57)</td>
</tr>
<tr>
<td>C</td>
<td>4 (28.57)</td>
</tr>
<tr>
<td>Total</td>
<td>11 (78.57)</td>
</tr>
</tbody>
</table>

Evaluation of the head containment within the acetabulum showed the AHI value in group A of 0.8, in the group B 0.7, and in the group C 0.6 (Figure 1).
show that the Herring classification is significant in predicting the outcome of treatment in children under six years of age (19).

Examination of the degree of collapse of the outer epiphysis pillar and the containment of the head in the acetabulum was biggest in group C, where the collapse of the epiphysis was most pronounced, in group B it was moderate, while in the group A it was least pronounced, and accordingly, the patients in group C were candidates for active surgical treatment. Patients in the Herring groups A and B were treated conservatively.

A limitation of this study is the small number of patients; larger number of patients would enable comparison of Herring groups of different ages.

REFERENCES

Značaj Herringove klasifikacije u predviđanju ishoda aseptičke nekroze glave butne kosti

Žarko Dašić¹, Miroslav Kezunović¹, Goran Pešić¹, Vesna Bokan², Mira Jovanovski³
¹Klinika za ortopediju i traumatologiju; ²Centar za fizikalnu medicinu i rehabilitaciju; ³Ministarstvo zdravlja; Podgorica, Crna Gora

SAŽETAK

Cilj Ukazati na značaj vrijednosti Herringove klasifikacije u planiranju liječenja Legg-Calvé-Perthesove bolesti (LCPB).


Rezultati Najmlađi ispitanik imao je 4,9 godina, a najstariji 9,11 godina; u polnoj strukturi muški pol je dominirao (muškarci:žene, 11:3). Desna strana je bila češće zahvaćena u odnosu na lijevu (8:6). Zastupljenost pacijenata u Herringovim grupama bila je tri pacijenta u grupi A, šest u grupi B i pet pacijenata u grupi C. AHI indeks bio je najmanji u grupi C. Pacijenti iz grupe C su operativno liječeni.

Zaključak Herringova klasifikacija omogućava prepoznavanje pacijenata s opsežnim promjenama i sugeriše vrstu liječenja.

Ključne riječi: Perthesova bolest, Herringova klasifikacija, liječenje