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Treatment of transient bone marrow oedema of the hip – a comparative study

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Abstract Between 1990 and 2000, we treated 43 patients with transient bone marrow oedema of the hip. Five were treated with nonsteroidal antiinflammatory drugs (NSAIDs) and limited weight bearing, and 38 by core decompression followed by limited weight bearing. At follow-up 2–10 years later, all patients were assessed by a structured interview as well as the Harris hip score (HHS) and the Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC). Both groups reached the same clinical outcome (HHS and WOMAC). Core decompression enabled a significantly faster recovery. There were no complications, but progression to avascular necrosis was seen in both groups. Core decompression induced fast pain relief, making it the preferable treatment.

Résumé Entre 1990 et 2000, nous avons traité 43 malades avec un oedème transitoire de la moelle osseuse de la hanche. Cinq ont été traités avec des drogues anti-inflammatoires (AINS) et appui partiel et 38 par forage chirurgical suivi d'un appui partiel. Àu suivi de 2 à 10 ans, tous les malades ont été étudiés par le biais d'une entrevue structurée notant le score de Harris score (HHS) et l'Index d'ostéoarthrose de l'Universités Ontario de l'Ouest (WOMAC). Les deux groupes sont arrivés au même résultat clinique (HHS et WOMAC). Le forage chirurgical a permis une récupération nettement plus rapide. Il n'y avait pas de complications, mais la l'évolution vers la nécrose avasculaire a été vue dans les deux groupes. Le forage chirurgical a induit un soulagement rapide de la douleur, ce qui en fait le traitement préférenciel.

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Introduction

Although clinical and radiological features of transient bone marrow oedema (TBMO) of the hip are very distinct, histological features are nonspecific [13]. It is therefore not known whether TBMO is a disease entity of its own, a transient osteoporosis, an atraumatic algodystrophy, or an early stage of avascular necrosis (AVN). The therapeutic approach to TBMO is based on the suspected aetiology and ranges from various symptomatic therapies [3] to core decompression [13]. Since TBMO is thought to be a fully reversible disease [11], there is controversy whether to treat it conservatively or operatively. The aim of this retrospective study was to compare results of a symptomatic therapy to core decompression in order to determine the appropriate treatment modality.

Materials and methods

All patients treated for TBMO between January 1990 and December 2000 at our hospital were included in this retrospective study. The diagnosis of TBMO was based on the typical clinical findings, being acute onset of hip pain and bone marrow oedema on MRI (hypointense area on T1-weighted sequences and a hyperintense area on T2-weighted sequences) after exclusion of the differential diagnosis of bone marrow oedema. All charts were thoroughly analysed for details of pain history, the beginning of treatment, and severity and duration of symptoms. Risk factors for AVN were noted. Harris hip score (HHS) before therapy was calculated retrospectively on the basis of an HHS assessment form, which is routinely filled out pre-operatively by all patients with hip disease.

Two groups were formed according to treatment. Group 1 was treated symptomatically with nonsteroidal analgesics and limited weight bearing. Group 2 was treated operatively by core decompression, in which a lateral approach to the hip was used. Under fluoroscopy, a K-wire was introduced 2–5 cm inferior to the greater trochanter and was drilled at least ten times into the affected part of the femoral head in a radial fashion. Post-operatively, patients were mobilised with ground contact for at least 6 weeks.

On the follow-up examination 2–10 (operative group 2–10, conservative group 2–4) years later, an exact history in regards to pain before and after treatment was taken. The time necessary for

complete recovery was noted on the basis of a structured interview. Functional and health status on the day of examination were assessed by HHS and Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC), the latter being a validated instrument for disease-specific outcome measures in patients with osteoarthritis of the hip [2]. The WOMAC has three sub-scales – Pain (Pain), Stiffness (Stiff) and Physical functional disability (Function) – and an Overall (Overall) score. In this study, we used a numerical rating scale ranging from 0 (no pain) to 10 (extreme pain). To score each scale, we calculated the mean of the item scores. The overall score was formed as the unweighted mean of the three scale scores.

A pelvic radiograph and a lateral view of the affected hip were taken to exclude AVN as well as other pathologies. HHS scores and WOMAC scales were compared using the Mann-Whitney *U* test for independent samples. Both groups were compared by Fisher's exact test in regards to duration of pain and the time necessary until normal daily activities, leisure activities, and work could be taken up again.

Results

Forty-three patients with TBMO were included in the study. Five patients were treated symptomatically (group 1) and 38 by core decompression (group 2). Average age was 44 (31–52) years in group 1 and 44 (17–64) years in group 2. Male-to-female ratio for group 1 was 4:1 and for group 2 30:8. The right hip was involved in 21 cases and the left in 22. Five patients were affected bilaterally. Complications due to treatment were not seen in either group. Average pre-operative HHS was calculated to be 38.6 (22.0–45.0) for group 1 and 48.5 (22.58–84.88) for group 2 (no significant difference, p=0.226). Average post-operative HHS was 80.60 (45.00–95.00) for group 1 and 77.32 (46.88–88.88) for group 2. There was no significant difference between groups regarding post-operative HHS (p=0.183). Average overall WOMAC score for the conservatively treated group was 2.08 (SD 2.37) and for the operatively treated group 1.30 (SD 1.71), with no statistical difference (p=0.699). WOMAC sub-scale scores are shown in Table 1.

To compare conservative therapy to core decompression, all retrospectively collected data assessing pain relief were dichotomised using 6 months of impairment as the cut-off point. The need for painkillers was significantly longer (p<0.001) in group 1; there was no significant difference in the use of crutches (p=0.642). Sleep interruption in group 2 was significantly shorter (p=0.009) than in the conservative treatment group. Daily activities were begun significantly earlier in group 2 (p=0.008). Disablement lasted slightly significantly longer in group 1 (p=0.056). There was no difference in the ability to commence recreational activities (p=0.143).

On radiographs, three patients (one in group 1 and two in group 2) progressed to AVN; the rest had no abnormalities on control radiographs. There was no statistical difference between the groups (p=0.316).

Table 1 Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC) sub-scales

WOMAC scales	Average score (SD)		*p* value
	Group 1	Group 2	
Pain	2.12 (2.39)	1.37 (1.85)	0.593
Stiff	2.23 (2.36)	1.28 (1.82)	0.568
Function	1.9 (2.45)	1.30 (2.37)	0.427

p values from Mann-Whitney *U* test for independent samples

Discussion

Since the first description of TBMO in 1959 [5], several terms [5, 8, 15, 29] have been used to describe the disease. Each was based on clinical and radiological findings and reflected the proposed aetiology at the time. The characteristic bone marrow oedema seen on MRI, which was thought to be fully reversible, eventually led to the term "transient marrow oedema syndrome" [31].

Before MRI became widely available, TBMO was diagnosed retrospectively. Therefore, histological studies [10, 19, 30] were rare. Despite early efforts to explain the pathophysiology [5, 15, 17, 30], aetiology remained obscure. Treatment concepts were conservative and based on the proposed aetiology. Only recently, larger histological studies [13, 18, 25] have been carried out to further characterise TBMO. In 1997, Plenk [26] studied the microscopic bone marrow changes in 30 patients with TBMO. In undecalcified biopsy specimens, he found an abundant new bone formation, dense marrow fibrosis, and fat vacuoles in the dilated medullary sinuses – findings that correlate well with bone marrow changes of type 1 and 2 in AVN, as proposed by Arlet [1]. There were osteocyte nuclei in the lacunae in contrast to types 3 and 4. For this reason, some authors [11, 18] do not consider TBMO as osteonecrosis. Despite the controversy regarding terminology, the early ischemic changes seen in TBMO justified core decompression as an alternative to

Table 2 Pain assessment: Comparison of non-operative (group 1) and operative (group 2) treatment

	Group 1	Group 2
Painkillers		
Less than 6 months	0	31
More than 6 months	5	4
Sleep interruption		
Less than 6 months	2	33
More than 6 months	3	2
Disablement		
Less than 6 months	0	23
More than 6 months	5	11
Leisure activities		
Less than 6 months	0	14
More than 6 months	5	21
Work		
Less than 6 months	1	24
More than 6 months	4	11

conservative treatment. Early studies [13, 26] demonstrated immediate pain relief after core decompression. However, while this treatment mode appears to be very effective, some authors consider it too invasive for a self-limiting disease with a variable clinical course [11].

In our study, we retrospectively analysed the results of operative and non-operative therapy over a period of 2–10 years. Although the operative group was considerably larger than the non-operative group, both groups are comparable in regards to gender and age distribution. In both groups, comparable HHS and WOMAC scores were achieved after therapy. Yet the time necessary to recover was different, and there was a significant difference between groups in regard to pain relief. In all categories (Table 2), even in the ability to start working, core decompression enabled a faster recovery with a significantly lesser need for painkillers and fewer sleep interruptions. This was also observed by Calvo [4] who prospectively followed up 12 hips that were either treated conservatively or operatively by core decompression. In his study, core decompression significantly shortened the duration of pain in TBMO.

Dunstan [9] observed mild pain relief with a sympathetic block but no shortening of the natural course of disease. Corticoids were tried with differing levels of success. Lakhanpal [20] administered corticosteroids orally in five patients at a dosage of 40 mg/d, Lequesne [22] administered them intra-articularly. Both did so without success. In contrast, good pain relief was experienced using either a combination of corticosteroids and NSAIDs [24] or calcitonin [7]. Duration of symptoms with different types of conservative therapies ranges between 2 and 46 months [3]. A shortening of the course of disease has not been observed, although a proper evaluation of the therapeutic effect of conservative therapy is difficult due to the reversible nature of TBMO. The best results with conservative therapy have been achieved by a combination of adequate analgesics and strict limitation of weight bearing [11]; the latter reduces the increased risk of fractures and ensures further pain relief [6, 12, 20, 21, 25].

In contrast, core decompression was reported to alter the natural course of the disease and to relieve pain immediately [28]. Nevertheless, mobilisation with crutches was necessary for 6–12 weeks post-operatively to prevent fractures [27]. Despite this, time to recovery was significantly shorter compared to the conservatively treated patients.

Side effects due to either therapy regime have not been observed. A progression to AVN (ARCO II) was seen in both groups. In all patients, analysis of the pretherapeutic MRI images revealed no double-line sign, epiphyseal scarring [16], or subchondral changes [23], all of which indicate an early progression to AVN. Nor did an analysis of predisposing factors reveal any risk factors for AVN. These observations are in accordance with Hofmann's theory [14], which proposes that ischemia reaches a sub-critical level in TBMO and causes diffuse ischemic damage to the femoral head, which is in turn repaired by an accelerated bone metabolism. The extent of repair determines whether TBMO resolves or proceeds to AVN.

Our results suggest that both forms of therapy reached the same clinical outcome. In comparison to symptomatic therapy, however, core decompression induced immediate pain relief, making patients fit for work in a significantly shorter period. Progression of TBMO to AVN was observed in both groups.

Although there are limitations to this retrospective study with uneven numbers of patients in the therapy groups, core decompression induces faster pain relief and prevents progression to AVN. However, conservative therapy remains acceptable for patients anticipating surgery. A prospective, randomised, multi-centre study is needed to further confirm our results.

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