

# THE INFLUENCE OF SKELETAL TRACTION ON INTRAARTICULAR PRESSURE OF THE HIP

by H. H. STRANGE-VOGENSEN, J. BAGGER, T. LIND and P. BLYME

**Patients with a femoral neck fracture often undergo skeletal traction until surgery. These patients may develop hip joint tamponade that can lead to necrosis of the femoral head. We have measured the pressure variations in 20 cadaveric hips using a semiflexion frame and various loads of skeletal traction. We found a significant decrease in pressure with loads of 5 kg or more of skeletal traction. Skeletal traction does not increase the risk of femoral head necrosis.**

**Keywords :** hip joint ; pressure ; skeletal traction.  
**Mots-clés :** hanche ; pression ; traction transosseuse.

## RÉSUMÉ

*H. H. STRANGE-VOGENSEN, J. BAGGER, Th. LIND et P. BLYME. Influence de la traction squelettique sur la pression intra-articulaire de la hanche.*

Les patients souffrant d'une fracture du col fémoral sont souvent placés en traction avant l'intervention. Chez ces patients, il peut se développer une compression intra-articulaire qui peut mener à une nécrose de la tête fémorale. Les auteurs ont mesuré les variations de la pression intra-articulaire dans 20 hanches de cadavres en utilisant un cadre en semiflexion et une force de traction squelettique variable. Ils ont constaté une diminution notable de la pression lorsque des poids de 5 kilos ou plus sont utilisés. La traction squelettique n'augmente pas le risque de nécrose de la tête fémorale.

## SAMENVATTING

*H. H. STRANGE-VOGENSEN, J. BAGGER, Th. LIND en P. BLYME. Invloed van skelettractie op de intra-articulaire druk van de heup.*

Patiënten met een mediale collum femoris fractuur worden meestal met draadrekverband geïmmobi-

liseerd in de pre-operatieve periode. De intraarticulaire druk in de heup kan verstoord zijn met mogelijk een heupkopnecrose voor gevolg. De auteurs hebben de drukvariaties gemeten bij 20 lijkheupen, met een semi-flexie kader en verschillende tractiegewichten. Zij vonden een relevant verschil in druk met een tractiekracht van 5 kg of meer. Een skelettractie verhoogt niet het risico van heupkopnecrose.

## INTRODUCTION

Hip joint tamponade is considered a risk factor leading to necrosis of the femoral head in femoral neck fractures (1, 2, 3, 4, 5). These patients often undergo skeletal traction until surgery. The pressure variations resulting from the skeletal traction have not been studied.

We report the intraarticular pressure variations in the hip, using a semiflexion frame and various loads of skeletal traction.

## MATERIAL AND METHODS

Twenty hip joints in 10 cadavers, 3 female and 7 male aged 64-84 years were used. After the rigor mortis was loosed the leg was lying freely on the table. The hip was in neutral flexion-extension, neutral abduction-adduction and slight outward rotation. The anterior aspect of the joint was dissected free and a 1.2 mm needle with a 1.4 × 1.0 mm side-hole was inserted obliquely through the joint capsule. The needle was connected to a manometer tube filled with saline for direct measuring. Ten cm of the manometer tube contained 1 ml of saline. Through a 3-way stop-

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cock synovial fluid was aspirated to assure the intraarticular position of the needle, and saline was injected to the starting pressure of 40.0 cm H<sub>2</sub>O (3.87 kPa, 29.8 mmHg) using about 20 ml of saline. The leg was moved from the starting position and placed on a semiflexion frame with 30° of flexion, and with unchanged rotation and abduction-adduction. The pressure was recorded. Tibial pin traction through the tibial tuberosity was applied, and the pressure was recorded with different loads of 2.5, 5.0, 7.5 and 10.0 kg. At the end of the procedure, control measurements in the starting position were performed, and if the pressure was within 0.49 kPa (5 mmHg) from the starting pressure we accepted the measurements. The patency of the system was assured by verifying immediate response to medial rotation. Pratt's test was used for statistic evaluation.

**RESULTS**

One case was rejected due to manometer leakage. The results of the measurements in 19 hips could thus be studied. The pressure in the hip joints decreased about 75% when the legs were positioned on the semiflexion frame. The pressure decreased further when skeletal traction with 5 kg or more was applied ( $P \leq 0.01$ ) (table I).

Table I. — The intraarticular hip-pressure measurements ± standard error mean (SEM) during the procedure. There were significant differences ( $P \leq 0.01$ ) between the pressures marked with §

N = 19	Intraarticular hip pressure ± SEM kPa	
Starting position	3.87	§
Semiflexion frame, 30° of flexion	0.96 ± 0.06	
Tibial pin traction, load		
2.5 kg	0.93 ± 0.06	§
5.0 kg	0.86 ± 0.06	§
7.5 kg	0.68 ± 0.06	§
10.0 kg	0.58 ± 0.06	§

**DISCUSSION**

The pressure fall with increasing loads from 0 to 10.0 kg results in displacement on average of

0.39 ml of saline from the manometer to the hip joint. This displacement results in a minimal increase in pressure which is of minimal importance to the recordings.

A pressure of 40 cm H<sub>2</sub>O (3.87 kPa, 29.4 mmHg) in the starting position was chosen since this is close to the average pressure found in displaced femoral neck fractures (1, 6), where a semiflexion frame and skeletal traction are relevant. The pressure fall when the leg is placed on the semiflexion frame is wellknown. The significant pressure fall with a load of 5.0 kg or more may be caused by outward rotation in the hip due to stretching of the twisted fibers in the capsule. Skeletal traction however has been reported to worsen the fracture position (7). The pressure fall in cadaver hips imply that skeletal traction is unlikely to increase the intra-articular pressure in vivo. In other words : Skeletal traction does not increase the risk of femoral head necrosis.

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