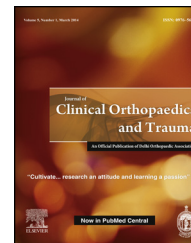


Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/jcot](http://www.elsevier.com/locate/jcot)

## Original Article

# Is the femoral head dead or alive before surgery of slipped capital femoral epiphysis? Interest of perfusion Magnetic Resonance Imaging



Chambenois Edouard MD<sup>a</sup>, Vialle Raphaël MD PhD<sup>b</sup>,  
Ducou Le Pointe Hubert MD PhD<sup>a,\*</sup>

<sup>a</sup> Université Pierre et Marie Curie Paris6, Department of Pediatric Imaging, Armand Trousseau Hospital,  
26 Avenue du Dr Arnold Netter, 75571 Paris Cedex 12, France

<sup>b</sup> Université Pierre et Marie Curie Paris6, Department of Pediatric Orthopaedics, Armand Trousseau Hospital,  
26 Avenue du Dr Arnold Netter, 75571 Paris Cedex 12, France

## ARTICLE INFO

## Article history:

Received 20 January 2014

Accepted 24 February 2014

Available online 31 March 2014

## Keywords:

Dynamic MRI

Unstable slipped capital femoral epiphysis

Dynamic gadolinium-enhanced subtraction sequences

Surgery

## ABSTRACT

**Background:** The most common complication of slipped capital femoral epiphysis (SCFE) is avascular necrosis (AVN) of the femoral head. Surgical treatments including reduction of the femoral head are considered as a risk factor for avascular necrosis. The purpose of this study was to investigate the role of perfusion Magnetic Resonance Imaging (MRI) into the surgical decision-making sequence.

**Methods:** Eighteen children with 19 slipped capital femoral epiphysis were retrospectively included. SFCE was unstable in nine cases and stable in ten cases. The slip angle was higher than 60° in 14 cases. Perfusion MRI with dynamic gadolinium-enhanced subtraction sequences were done in all the cases before and after surgical treatment.

**Results:** On nineteen hips, eight were devascularized before surgery. All were unstable. After surgery, six on eight had a complete revascularization, one had a focal necrosis and one remained devascularized. A postoperative devascularization with normal preoperative MRI was noted once. On nineteen hips, a total of three avascular necrosis occurred.

**Conclusion:** Perfusion MRI is useful to assess preoperative and postoperative vascular status in SFCE. Preoperative devascularization could improve or stay equal after surgical treatment. Persistent devascularization could be responsible for avascular necrosis of the femoral head.

Copyright © 2014, Delhi Orthopaedic Association. All rights reserved.

## 1. Introduction

Slipped capital femoral epiphysis (SCFE) is the most common hip disorder affecting adolescents with a predilection for boys.<sup>1</sup> SCFE is characterized by a posterior displacement of the

femoral head (epiphysis) and anterior displacement of the femoral neck (metaphysis). Pathogenesis remains unclear; SCFE could be a multifactorial process resulting from biomechanical factors such as obesity, increased femoral retroversion and metabolic disorders with a relative imbalance of hormones.<sup>2</sup> Prognosis of SCFE is conditioned by the severity of

\* Corresponding author. Tel.: +33 14736124; fax: +33 144736511.

E-mail address: [hubert.ducou-le-pointe@trs.aphp.fr](mailto:hubert.ducou-le-pointe@trs.aphp.fr) (D.L.P. Hubert).  
<http://dx.doi.org/10.1016/j.jcot.2014.02.004>

0976-5662/Copyright © 2014, Delhi Orthopaedic Association. All rights reserved.

**Table 1 – Clinical presentation and severity.**

Gender	
Female	4
Male	14
Age	10–16 years (mean 13.3)
Stability	
Stable	10
Unstable	9
Slip	
Mild $\leq 30^\circ$	0
Moderate $> 30 \leq 60^\circ$	5
Severe $> 60^\circ$	14

femoral head displacement and the results of surgical treatment.<sup>3</sup> Surgery aims to reduce and stabilize the femoral head displacement to avoid further slippage and complications such as chondrolysis and avascular necrosis (AVN). Avascular necrosis of the femoral head leads to a poor functional outcome and early hip osteoarthritis.<sup>4,5</sup> A lot of studies tried to identify factors influencing occurrence of AVN. Instability,<sup>3,5–7</sup> surgical reduction,<sup>8</sup> number and localization of pins,<sup>7</sup> young age,<sup>5</sup> severity of femoral head displacement<sup>9</sup> were identified as risk factors but some of them are controversial. Instability and complete or partial reduction are recognized to be the most important factors influencing the risk of AVN.<sup>3,5</sup> The challenge in SCFE is to get the best functional outcome with the safer surgical procedure regarding femoral head vascularization. It remains unclear whether the devascularization is due to femoral head slip itself or to surgical procedures aiming to reduce it. Gadolinium-enhanced MR imaging is a non-ionizing radiation technique that has been used to demonstrate lack of adequate blood flow in ischemic bone with a perfect histologic correlation.<sup>10,11</sup> MRI with dynamic gadolinium enhanced subtraction sequences appeared to be a reliable technique for the evaluation of the femoral head vascularization in Legg Calve Perthes disease and in SCFE. This technique has a good sensitivity, high space

and contrast resolution to detect femoral head morphologic abnormalities and assess ischemia severity.<sup>12–15</sup> We propose to evaluate dynamic gadolinium enhanced subtraction MRI following femoral head vascularization in SCFE requiring surgical treatment.

## 2. Material and methods

### 2.1. Patients

This study is a retrospective review of MR imaging of children who underwent MRI before and after surgery for slipped capital femoral epiphysis in our institution between 2007 and 2013. Our local ethics committee approved this study. Eighteen children: four girls and fourteen boys were included in this study. The mean age was 13.4 years (Table 1). One child had a bilateral slippage at the moment of the diagnosis so nineteen hips were evaluated, always confirmed on plain. We classified SCFE according to the clinical and radiographic findings regarding stability and severity. Stability or instability was defined as the ability or inability to bear weight on the affected hip.<sup>7</sup> The severity was based on the slip angle measured on MRI axial slices (mild for slip angle lower than 30°, moderate comprised between 30° and 60° and severe higher than 60°).

The average delay between the beginning of symptoms and preoperative MRI was 4 months for stable slippage and 5 days for unstable slippage. The average delay between surgery and postoperative MRI was 17 months for stable slippage, and 13 months for unstable slippage (Table 4).

Surgical procedures were not univocal and classified according three different surgical modalities: Open reduction and internal fixation (ORIF), closed manipulation and percutaneous fixation (screwing) and in-situ percutaneous fixation (screwing). For all patients, non-weight bearing was allowed between diagnosis and surgery.

**Table 2 – Vascularization before and after surgery and clinical features.**

Patient	Age	Gender	Stability	Slip	Preoperative vascularization	Postoperative vascularization	AVN
1	14	M	S	68°	N	N	No
2	11	F	S	58°	N	N	No
3	13	M	U	82°	gD	H	No
4	10	M	U	76°	gD	gD	Yes
5	14	M	U	65°	gD	N	No
6	16	M	S	40°	N	N	No
7	11	M	U	75°	gD	N	No
8	13	M	S	58°	H	N	No
9	15	M	U	88°	gD	fD	Yes
10	15	M	U	61°	gD	H	No
11	16	M	S	63°	H	H	No
12	14	F	S	82°	H	N	No
13	12	M	S	86°	H	H	No
14	16	M	U	91°	H	fD	Yes
15	13	F	U	70°	gD	N	No
16	12	M	U	65°	gD	N	No
17	14	M	S	52°	H	N	No
18	12	F	S	72°	H	N	No
18 bis	12	F	S	49°	N	N	No

M: male, F: female, S: stable, U: unstable, N: normal, g D: global devascularization, f D: focal devascularization, H: hyperemia.

Download English Version:

<https://daneshyari.com/en/article/3245367>

Download Persian Version:

<https://daneshyari.com/article/3245367>

[Daneshyari.com](https://daneshyari.com)