

# Doctor's delay in diagnosis of slipped capital femoral epiphysis

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## ABSTRACT

**INTRODUCTION:** Slipped capital femoral epiphysis (SCFE) is one of the most common hip disorders in the adolescent child. The primary treatment is acute epiphysiodesis. Diffuse symptomatology seems to delay diagnosis and delayed treatment entails a risk of complications. Via the independent Danish Patient Insurance Association (DPIA), Danish patients have been able to file a claim when an unexpected side effect or injury has resulted from their medical treatment. The DPIA is based on a no-blame, no-fault case evaluation, which is free of charge and without any legal action. We wanted to examine the causes of complaints through closed claim analysis.

**MATERIAL AND METHODS:** In the DPIA, all medical statements and internal DPIA notes are stored and available for detailed scrutiny. Cases from 1996 to 2011 were investigated for treatment failures.

**RESULTS:** A total of 40 cases were included. The mean age of the children was 12.4 years. A doctor's delay (DD) of the diagnosis was found in 27 case files, with an average 181-day delay. The education and specialisation of the doctors responsible was diverse. Often orthopaedic surgeons would make the correct diagnosis. Complications to surgery were found in 16 cases. In all, 22 of the 40 cases were economically compensated, 16 cases were categorised as "severe disability" by the DPIA.

**CONCLUSION:** This study used closed claim analysis to determine that DD might result in a deteriorated treatment result in children with SCFE. Hopefully, awareness of the disease may lead to an earlier correct diagnosis and hence improve the outcome for the child.

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**TRIAL REGISTRATION:** not relevant.

Slipped capital femoral epiphysis (SCFE) is one of the most common hip disorders in the adolescent child [1]. SCFE is caused by a slip of the metaphysis in respect to the femur head due to disturbances in the epiphyseal plate during rapid growth [1, 2]. SCFE is most often non-traumatically induced, and symptoms of SCFE are often diffuse and presenting from both the upper and lower part of the limb – frequently with pain of the hip or knee [1-3]. Often, the misleading symptomatology makes diagnostics difficult and may lead to X-raying of the knee prior to correct diagnosis. The primary treatment is im-

mediate admission and surgical fusion of the slipped epiphysis – acute epiphysiodesis. However, the diffuse symptoms seem to result in a delay in diagnosis and treatment due to primary misdiagnosis of the child [1-3]. Delayed treatment results in a higher risk of severe complications; destruction of the hip due to avascular necrosis (AVN), persisting deformation of the hip with impaired movement and, in the longer term, early osteoarthritis [4-6]. We found it necessary to examine the causes of the delay in the diagnosis of SCFE.

The Patient Insurance Act was passed by The Danish Parliament and effected through the independent Danish Patient Insurance Association (DPIA) in July 1992; from then on, patients have been able to file a claim after which the DPIA considers if an injury or an unexpected side effect has resulted from their medical treatment. The consideration is made on a no-blame/no-fault basis without any legal action being taken. Specifically, the DPIA is limited to considering any deterioration in medical condition due to the injury or any side effects. This process is free of charge; its purpose is to allow the patient to seek financial compensation and it is granted under any of the following conditions [7, 8]:

- i) An experienced specialist would have acted differently, whereby the injury could have been avoided.
- ii) Defects in or failure of the technical equipment were of major concern with respect to the incident.
- iii) The injury could have been avoided by using alternative treatments, techniques or methods that were considered to be equally safe, and would potentially have offered the same benefits.
- iv) If the injury is rare, serious and more extensive than the patient may be expected to endure.

The compensation is calculated on the basis of the extent of pain and suffering, any reduced ability to work and reduced income, additional medical expenses and whether the injury may be expected to be permanent. Moreover, the compensation reflects the degree of permanent injury as calculated by a scoring system. However, the amount of compensation should exceed a minimum of 1,500 euros. Patients may appeal a decision made by the DPIA to the Patient Damage Appeal Board

## ORIGINAL ARTICLE

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and to the Danish legal system. In this study, cases of SCFE were analysed through closed claim analysis to establish the causes of complaints and any clinical mis-treatment associated with the complaints.

### MATERIAL AND METHODS

The DPIA has presently received and processed over 90,000 claims of which approximately 36% have been approved. The DPIA database has stored these claims along with patient files and any related medical statements from general practitioners and specialists. This material provides a firm basis to perform closed claim analysis to examine and identify recurrent patterns in the treatment failures in general. In this particular study, we studied treatment failures in orthopaedic treatment related to epiphysiolysis of the hip in children.

For each case, a patient folder from the DPIA – containing the diagnosis, treatment and type of injury – was extracted. Moreover, all medical statements and all journal files pertaining to the cases are present and may be examined in detail. Furthermore, the analysis and conclusions from the medical consultants are available, as are the DPIA files and internal notes.

Consequently, all available data from the DPIA can be searched and thoroughly analysed and compared. The design of the study was retrospective, and we exam-

ined all relevant claims through systematic investigation of all documents. The DPIA database was searched for all occurrences of epiphysiolysis of the hip in children. All the case files featuring the diagnosis code DM930 from 1996 to 2011 in patients younger than 15 years of age were thoroughly examined, and we retrieved documentation from the first symptoms were reported to correct diagnosis had been made, treatment had been provided and, in many cases, complications had occurred. Hence, every case was thoroughly searched to establish the types of treatment failure. The causes of the complaints were examined in relation to these four categories [9]:

- A) Delay in diagnosis or misjudgement of the severity of the disease (including level of competence of the diagnosing doctor and type of hospital).
- B) Common guidelines for the treatment and observation were not followed.
- C) Complication due to surgical error.
- D) An accidental complication of the disease/ treatment affecting its severity and therefore the patient's general health.

The Committees on Health Research Ethics for the Capital Region of Denmark subjected this project to the Danish Act on Research Ethics Review of Health Research Projects and approved it on 13 April 2012 (J. no. H-4-2012-023).

*Trial registration:* not relevant.

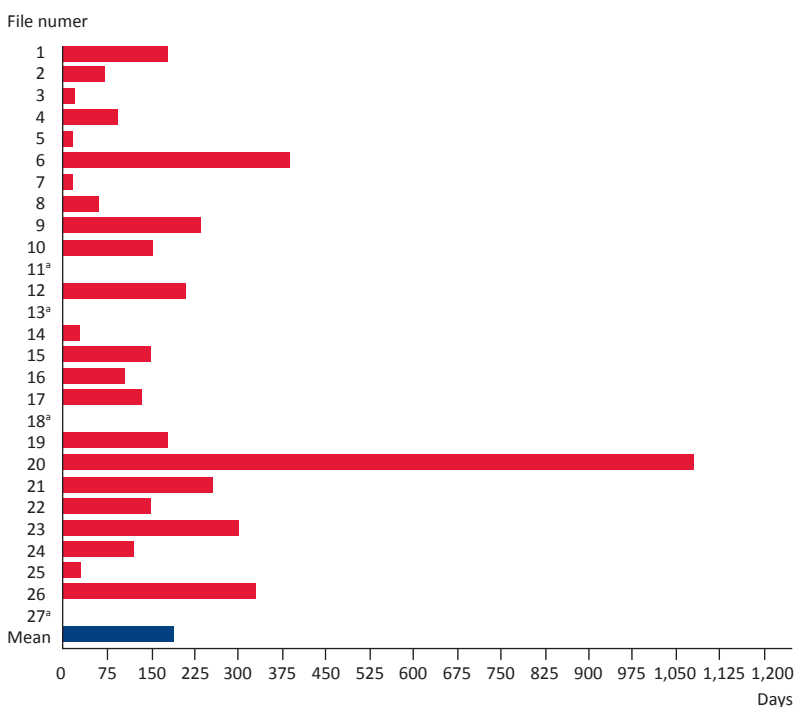
### RESULTS

The DPIA database was searched for all the case files from 1996 to 2011; all cases with the WHO diagnosis code DM930 were extracted for patients younger than 15 years of age. This resulted in a total of 44 SCFE cases. Two cases were excluded since the hip disease originated from another disorder, e.g. a cancer diagnosis of the hip. Two cases were doublets and were also excluded. This resulted in a total of 40 cases. The mean age of the children in these cases was 12.4 years, ranging from nine years to 15 years of age. A total of 20 of the cases concerned boys and 20 girls. In 22 cases, the left hip was affected. Bilateral SCFE was seen in six of the cases. A total of 39 cases were non-traumatically induced; and in one case, the disorder was described as traumatically induced.

No consensus was found with regard to classification of the slips in the SCFE cases and the case files. Some doctors use angular measures from the X-ray findings for classification, and other doctors described the slips according to the many different classification systems found in the literature.

**FIGURE 1**

Doctor's delay in number of days.



Doctor's delay (DD) in relation to diagnosis was described in 27 case files. In 23 of the cases, the delay was described in number of days, weeks or months (**Figure 1**). In four cases, no exact number of days, weeks or months was stated, only the coding from the DPIA indicated the DD. In total, we found an average 181-day delay. Time to correct diagnosis ranged from two weeks to three years (**Figure 1**). The complaint in all of these 27 cases was the diagnostic delay and thereby the delayed initiation of SCFE treatment.

The range of education, specialisation and training of the doctors who were held responsible in the DPIA case files varied. Seven of the doctors held responsible were general practitioners (GPs); in 20 cases a resident (junior doctor with little orthopaedic training) was held responsible; and in 13 cases, a trained orthopaedic surgeon was responsible according to the DPIA files (**Figure 2**). The doctor making the correct diagnosis was most often an orthopaedic surgeon. In five cases, the complaints concerned treatment in orthopaedic departments that are now considered highly specialised in treating SCFEs [10]. The remaining complaints concerned treatment performed in other, not highly specialised departments.

In Denmark, the most frequently used treatment method is closed fixation with a single screw with or without reduction prior to the fixation. Open surgery was mentioned only in the case of material error that needed to be corrected. Complications to surgery or complications resulting from the SCFE disease were reported in the case files of 16 patients. In all cases, appropriate treatment was initiated once the patient had been diagnosed correctly, including immediate surgery in an instable slip. However, one case had complaints due to the anaesthesia and one case due to a secondary fracture (B). Four of the 16 cases complications were AVN, nine cases ongoing pain and the final four concerned persisting deformation of the hip (C and D) (**Figure 3**).

The DPIA categorised the cases according to the persistence of the damage using the Lex Maria classification. The Lex Maria classification system consists of four classes which range the damage from "no damage" to "severe disability". In sixteen cases, the permanent damage was categorised as a "severe disability", and a total of 22 out of the 40 case file complaints were economically compensated.

## DISCUSSION

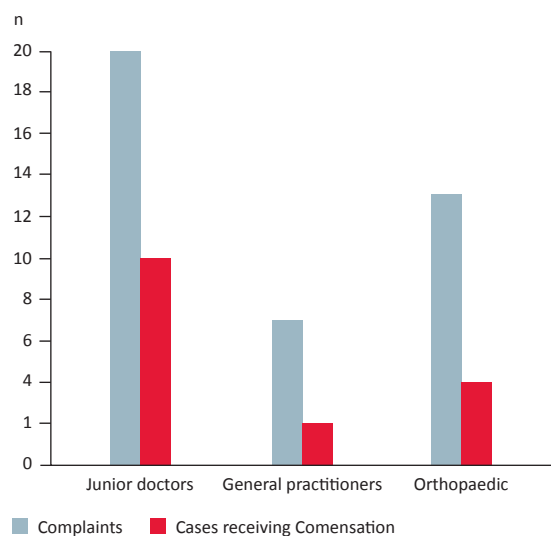
This study reveals that the majority of the complaints concerned DD of diagnosis. We found that the child had most often been consulting a junior doctor or a GP prior to seeing a trained orthopaedic surgeon, who then most often made the correct diagnosis. However, diagnosis

was not necessarily made in a highly specialised children's orthopaedic unit, but more often in a general orthopaedic department. This would seem appropriate since correct treatment was initiated once the condition had been diagnosed correctly.

The complications of SCFE are AVN, persisting deformation with impaired movement of the hip and per-

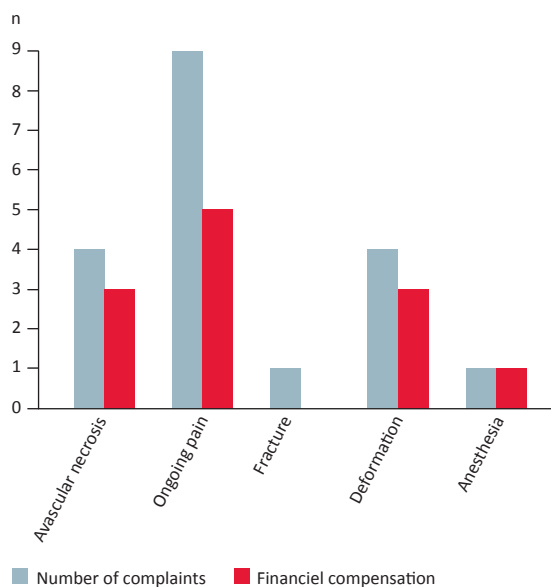
**FIGURE 2**

Doctor's level of training/experience and number of cases receiving economic compensation.



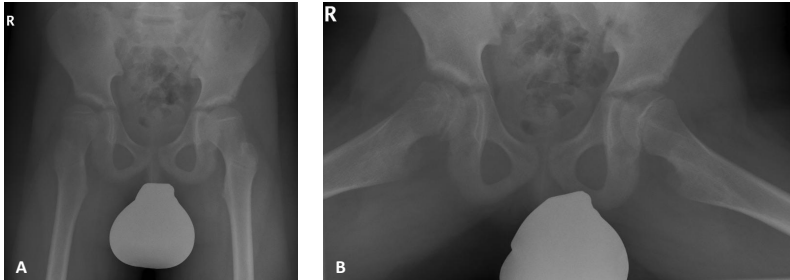
**FIGURE 3**

Economic compensation in relation to type of complication to the slipped capital femoral epiphysis.




**FIGURE 4**

**A.** X-ray findings in a patient with discrete right-sided slipped capital femoral epiphysis, Hvidovre Hospital. **B.** X-ray findings in a patient with slipped capital femoral epiphysis. A severe and displaced slip of the right hip, Hvidovre Hospital.



sisting pain in relation to the impingement phenomenon [1, 2, 5, 6]. The condition is also reported to lead to early osteoarthritis of the hip resulting in early surgery with hip arthroplasty [11]. The SCFE reported in the DPIA cases was found to result in the same scenario of late complications. Diagnostic delay seems to be associated with a higher risk of late complications. Thus, in more than half of the cases, the patients received compensation, and one third of the cases are categorised as “severely disabled”. This would warrant more awareness of the condition during the children’s first health-care contact to their GP or the junior doctors of emergency rooms. We find this especially relevant since the prevalence of SCFEs is reportedly high in Denmark [12], and since complications to SCFE and its treatment in Denmark were also reported to be relatively high [12]. Moreover, earlier closed claim studies show that only some of health-related adverse events are exposed by this type of analysis [13]. Since complications to SCFE present over a long period of time, the patients in our case files might not yet have been presenting with long-term symptoms and thereby late complications; it is therefore possible that this study may have revealed only the tip of the iceberg [11].

In general, closed claim analysis is a methodology which has been utilised both nationally [8, 9] and internationally [13] to highlight procedural weaknesses and complications, especially in the anaesthesiological area. To our knowledge, we are the first to successfully apply the closed claim analysis method in the orthopaedic field. The Danish system of no-blame/no fault seems to provide a good basis for elucidation of health care-related problems, and could be employed as a first step to identify potential means for improving patient safety and preventing future injury.

## CONCLUSION

This study has used closed claim analysis to identify that

doctor’s delay seem to be the primary cause of health-related complications in children in the diagnosis of SCFE. Awareness of this disease in the primary diagnostic “chain” would seem appropriate for earlier diagnosis. This analysis emphasises the need for early and a more thorough X-ray examination of the limping child. Hopefully, our results and a planned secondary examination of the affected children in this study will shed light on the long-term health consequences in these children and will help to facilitate procedural changes for a swifter diagnosis of SCFE (**Figure 4**).

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