Symptoms of Nerve Dysfunction After Hip Arthroscopy: An Under-Reported Complication?

Christian Dippmann, M.D, Ph.D., Kristian Thorborg, Ph.D., Otto Kraemer, M.D., Søren Winge, M.D., and Per Hölmich, M.D.

Purpose: The primary purpose of this study was to analyze the rate, pattern, and severity of symptoms of nerve dysfunction after hip arthroscopy (HA) by reviewing prospectively collected data. The secondary purpose was to study whether symptoms of nerve dysfunction were related to traction time. Methods: From March to October 2010, 52 consecutive patients—27 male patients (mean age, 40 years; range, 21 to 63 years) and 25 female patients (mean age, 37 years; range, 15 to 60 years), underwent HA with labral repair, rim trimming, and osteoplasty. The patients received a follow-up questionnaire 1 year after HA concerning symptoms of nerve dysfunction, possible localization, and erectile dysfunction. Fifty patients participated and returned fully completed questionnaires. Patients reporting symptoms of nerve dysfunction 1 year after HA were re-examined. Results: Twenty-three of 50 patients (46%) reported symptoms of nerve dysfunction during the first week after HA; this was reduced to 14 patients (28%) after 6 weeks, 11 patients (22%) after 26 weeks, and 9 patients (18%) after 1 year. One patient experienced temporary erectile dysfunction. No difference in traction time between patients with symptoms of nerve dysfunction (n = 23) and patients without (n = 27) was found (98 minutes vs 100 minutes; P = .88). Conclusions: Forty-six percent of patients undergoing HA reported symptoms of nerve dysfunction within the first 6 weeks after surgery. One year postoperatively, these symptoms remained in only 18% of all patients. Traction time during surgery was not different in patients with and those without symptoms of nerve dysfunction. Level of Evidence: Level IV, therapeutic case series.

Hip arthroscopy (HA) has become a standard procedure in addressing intra-articular pathologic conditions of the hip joint such as femoroacetabular impingement (FAI). Nerve affection is a known complication related to HA. Generally, there has been limited focus on complications after HA. In 2003, Clarke et al. described an overall complication rate of 1.4% in a prospective study of 1,054 cases. Vascular lesions, postoperative infection, and postoperative nerve affection—whether described as neuropraxia, nerve injury, or dysesthesia—are the most common complications reported. The rate of nerve complications published in the literature varies from 1.4% to 10% and is usually inconsistent regarding localization, duration, and type. Furthermore, it remains unclear if these complications were identified by the surgeons during follow-up examinations or if they were patient reported. The localization, degree, and duration of nerve affection may depend on the surgical setup, including the accumulated time of traction and traction force. There are no standards or consensus regarding the duration of traction, when and if traction-free intervals are needed, and how long they should last. Because it has been suggested that prolonged traction time and high traction force lead to increased risk of nerve injury, some authors have advocated that traction time should be reduced to 120 minutes, and others have favored average traction forces around 200 N. However, according to our literature review, this has not been the subject of research and is based only on expert opinion. Usually, 2 major sources of nerve injury in relation to HA have been described in the literature: pudendal nerve injury resulting from compression against the perineal post and sciatic or femoral neuropraxia (or both) resulting from traction, none of which have so far been objects of scientific interest. Only in the treatment of proximal femoral fractures using...
standard fracture tables and standard perineal posts is neuropathia a well-known complication, in which dysesthesia of the pudendal nerve is found with a rate up to 17%. The primary purpose of this retrospective study was to identify the self-reported rate of symptoms of nerve dysfunction after HA and their pattern in a consecutive series. Our secondary purpose was to study the influence of traction time and determine if this was related to the development of symptoms of nerve dysfunction. Our hypotheses were (1) that nerve dysfunction after HA is more common than previously reported in the literature and (2) that increased traction time would be associated with symptoms of nerve dysfunction.

Methods

All patients were scheduled for labral repair, rim trimming, and osteoplasty. All patients underwent these procedures, except 4 patients who did not undergo osteoplasty. Labral repair was not possible in one patient because of advanced degeneration, and a labral reconstruction with an iliotibial band autograft was performed. At the time of surgery for this investigation, both surgeons were experienced hip arthroscopists who performed more than 50 hip arthroscopies per year.

Before surgery, all patients underwent clinical examination, including an examination of sensibility around the index hip/groin, and completed a self-reported questionnaire regarding sensibility problems in the perineum and legs. They were told to notice if and how long any sensory disturbance lasted. Male patients were asked about erectile dysfunction. In our questionnaire, the patients had to answer 4 simple questions: (1) Do you have reduced sensibility (numbness, tingling, or pricking) in the hip/groin region? (2) Do you have reduced sensibility (numbness, tingling, or pricking) in the leg? (3) If any of the answers is “yes,” where and for how long? (4) Have you experienced erectile dysfunction?

No problems were reported at this point. Postoperatively, the questions in the questionnaire were: (1) Have you had reduced sensibility in the leg or the hip and groin region and did you have lacerations in your genitals? (2) If yes, how long?

Postoperatively, all patients were scheduled for follow-up examinations 6 to 12 weeks after surgery. All patients were examined fully, including examination for reduced sensibility. Not all patients completed a questionnaire at this point, but any alterations in sensibility were recorded in the patient records for later use. Furthermore, all patients were informed of the purpose of this study before surgery, at discharge, and at follow-up consultations (2 to 12 weeks postoperatively) and told that they would be contacted within a year to gather information regarding symptoms of nerve dysfunction and their pattern for the index leg.

One year after surgery, the patients received the same self-reported questionnaire regarding sensibility problems in the index leg after HA. In the questionnaire, the patients were asked if they had reduced sensation directly after surgery and how long this lasted. These results were compared with their previous findings. Patients described the localization in their own words or marked the area on an illustration, or both. Male patients were again asked to report any kind of erectile dysfunction postoperatively.

All patients reporting ongoing reduced sensation after 52 weeks were re-examined in the outpatient clinic by the surgeon. The area was examined manually and with the contralateral leg as reference. Subjective absence or reduction of tactile perception described as numbness, tingling, or pricking was defined as symptoms of nerve dysfunction. In the area of interest, light touch was tested digitally by light finger touch. In case the patient noticed a change in sensation in a certain area, he or she was re-examined by randomly alternating stimuli with the sharp or dull end of a safety pin. Afterward, the approximate extent of sensory disturbance was measured in centimeters.

A standard setup was used in all patients, focusing especially on the positioning of the patient and padding of the areas exposed to compression and traction. The patient was placed in the supine position on a fracture table using a perineal post to provide countertraction and as a fulcrum (Fig 1A). To reduce the risk of neuropathia of the pudendal nerve we used a 23-cm-wide foam-padded perineal post (Bledsoe Brace Systems, Grand Prairie, TX). Both feet were placed in 1.5-cm-thick foam boots (Bledsoe Brace Systems) before they were mounted in the fracture table boots (Fig 1B). The genitals were checked at positioning and whenever traction was applied. For stabilization of the pelvis, the contralateral leg was mounted in a traction boot without regular traction. The traction force was not measured. To gain sufficient space for instrumentation in the central compartment, the joint was distracted by 10 to 15 mm with unknown traction force. Traction time was limited to 105 minutes. In case a second traction period was necessary, a 30-minute pause was mandatory. Traction times as well as traction-free intervals were noted. We only used 2 portals (anterolateral and inferior midanterior) (Fig 1C). No supplemental portals, e.g., posterior portals, were used. For instrumentation, slotted (half-pipe) cannulas were used as well as a cannula during labral repair. The labral repair, rim trimming, and osteoplasty were performed using the technique described by Philippon et al.15
Data Reduction and Statistical Analysis

Descriptive statistics are given, including mean, range, and percentages. Analysis of traction time for patients with and those without symptoms of nerve affection was performed using statistical analysis for independent samples. Because data for traction times did not show a normal distribution, nonparametric statistics were used (Mann-Whitney U test for independent samples), with a significance level set at 5%. Medians and percentiles (25th to 75th) are given. SPSS, version 17 (SPSS, Inc, Chicago, IL) was used to calculate all statistics.

Results

The 52 HAs were performed in 27 male patients (mean age, 40 years; range, 21 to 63 years) and 25 female patients (mean age, 37 years; range, 15 to 60 years) at 2 separate institutions after the same surgical setup. Two patients (one woman and one man) were lost to follow-up, leaving 50 consecutive patients (26 men; mean age, 41 years; range, 21 to 63 years; and 24 women; mean age, 37 years; range, 15 to 60 years) to be included in this study. The physical activity level of the patients varied according to their jobs (white and blue collar workers as well as students) and the degree and amount of recreational sports activities. All patients were healthy individuals with a score 1 or 2 according to the American Society of Anesthesiologists.

Twenty-three patients (46%) reported symptoms of nerve dysfunction within the first week after surgery. The number of regions with symptoms of nerve dysfunction and the duration over time within the first year can be seen in Fig 2. Five patients had isolated symptoms at the index foot, 5 patients at the perineum, and 8 patients at the lateral thigh. Five patients experienced reduced sensibility at multiple locations: 4 patients had 2 areas of reduced sensibility (genitals/foot, lateral thigh/foot, erectile dysfunction/lateral thigh, and genitals/lateral thigh, respectively), and 1 patient had 3 different areas of reduced sensibility (genitals/foot/lateral thigh). One patient reported temporary erectile...
Table 1. Localization of Permanent Nerve Affection

<table>
<thead>
<tr>
<th>Patient</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10-×10-cm reduced sensation at the lateral thigh</td>
</tr>
<tr>
<td>2</td>
<td>5-×5-cm numbness around the stab incisions</td>
</tr>
<tr>
<td>3</td>
<td>5-×15-cm reduced sensation at the lateral thigh</td>
</tr>
<tr>
<td>4</td>
<td>10-×15-cm reduced sensation around the portals and down the lateral thigh</td>
</tr>
<tr>
<td>5</td>
<td>7-×12-cm anterolateral, reduced sensation around the portals</td>
</tr>
<tr>
<td>6</td>
<td>10-×7-cm reduced sensation anteroposterior at the level of the portals</td>
</tr>
<tr>
<td>7</td>
<td>3-×10-cm reduced sensation distal from the portals</td>
</tr>
<tr>
<td>8</td>
<td>5-×10-cm reduced sensation distal from the portals</td>
</tr>
<tr>
<td>9</td>
<td>1-×1-cm at the index leg’s left toe</td>
</tr>
</tbody>
</table>

dysfunction within the first 7 weeks after surgery. Nine patients (18%) had symptoms after 1 year. The re-examination of these 9 patients showed that 8 of them had symptoms of nerve dysfunction at the lateral thigh, mainly located around the portals (Fig 1D), whereas one patient (2%) had symptoms of nerve dysfunction at the dorsal side of the first toe (Table 1). All 9 patients with reduced sensibility longer than 52 weeks had an HA with rim trimming and labral repair and all but one had a femoral osteoplasty. Among the 9 patients there were 4 women and 5 men, with an average age of 42 years (range, 22 to 63 years).

The number of patients with symptoms of nerve dysfunction decreased within the first year, with the most rapid decrease within the first 6 weeks after surgery (Fig 2). The average age of patients with reduced sensibility (n = 23) was 36 years (range, 15 to 60 years): 14 female patients (average age, 34 years; range, 15 to 60 years) and 9 male patients (average age, 42 years; range, 23 to 63 years). The average age of patients with normal sensibility (n = 27) was 40 years (range, 21 to 61 years): 10 female patients (average age, 40 years; range, 15 to 50 years) and 17 male patients (average age, 40 years; range, 21 to 54 years).

To rule out bias from the fact that the procedures were performed by 2 surgeons, we analyzed their individual rates of patients with and those without reduced sensibility. Surgeon A performed 24 HAs with labral repair and osteoplasty. Among these patients, 8 had reduced sensibility, 4 cases of which lasted more than 52 weeks. Surgeon B performed 26 procedures, with 15 patients having reduced sensibility, 6 cases of which lasted more than 52 weeks.

Furthermore, there was no difference between the patients who underwent (n = 46) and those who did not undergo (n = 4) osteoplasty. Among the patients who did not undergo osteoplasty, 2 had symptoms of nerve dysfunction. One of these patients had symptoms for approximately 1 week at the index foot, whereas the other had symptoms of nerve dysfunction for more than 52 weeks at the lateral thigh. There was no significant difference in median traction time between the group with and the group without nerve dysfunction (98 minutes; range, 94 to 110 minutes [n = 23] v 100 minutes; range, 90 to 115 minutes [n = 27]; median, 25th to 75th percentiles; P = .884).

Two main subgroups of patients with symptoms of nerve dysfunction were identified: patients with isolated nerve dysfunction symptoms at the anterolateral thigh (n = 8) and patients with symptoms in the genitals or foot, or both (n = 15). Because symptoms at the anterolateral thigh are mainly located around the portal holes, and therefore may be assumed to be related to the surgical incision and instrumentation rather than traction, this type of nerve dysfunction is considered to have a different cause from that of nerve dysfunction in the genitals or foot, or both. We therefore decided in retrospect to perform a post-hoc analysis in which the traction time of a combined group of patients without symptoms of nerve dysfunction and patients with isolated symptoms of nerve dysfunction only at the anterolateral thigh (n = 35) was compared with the traction time of the patients with symptoms of nerve dysfunction in the genitals or foot, or both (n = 15). In this post-hoc analysis, there were no significant differences in median traction time between these groups (98 minutes; range, 90 to 110 minutes [n = 35] v 101 minutes; range, 95 to 120 minutes [n = 15]; P = .518).

**Discussion**

In patients undergoing HA, nerve injury is reported to be the most common postoperative complication, but the reported rate is low. The rate of nerve complications published in the literature varies from 1.4% to 10%2-8,10 and is usually inconsistent regarding the localization, duration, and type of nerve affection.

In 2003, Clarke et al.2 described 4 cases of neuropraxia (3 at the sciatic nerve and 1 at the femoral nerve) in 1,054 cases of HA. All resolved within the first 6 hours after surgery. Byrd et al.16 reported 3 nerve-related complications among the first 100 patients who underwent HA from 1993 to 2003: “a transient neuropraxia of the pudendal nerve and a transient neuropraxia of the lateral femoral cutaneous nerve, both of which resolved uneventfully.” Sampson et al.8 described 20 transient nerve injuries that resolved within the first week after HA. However, it remains unclear if these nerve injuries were identified by the surgeons during follow-up examinations or if they were patient reported. To our knowledge, the present study is the first in which all patients were asked about nerve affection before and after surgery and in which patients were re-examined when reporting such long-standing changes. This might be one reason why the number of patients describing nerve affection in our study is higher than that published in other studies about HA.

Access to the central compartment requires longitudinal traction that increases the risk of nerve dysfunction. Because midterm results indicate that labral repair...
is superior to debridement,\textsuperscript{10,11,17-20} refixation of the labrum during traction is necessary. All our patients underwent HA with labral repair. We did not measure the traction force applied, but the force was sufficient to have the joint distracted 10 to 15 mm. According to our protocol, the traction time was limited to 105 minutes, and whenever a second traction period was needed, a 30-minute pause was mandatory. In our study, 15 patients (29\%) reported nerve dysfunction located at the genitals and the foot. We believe that these are indirect lesions related to the traction force applied. Only one of these patients still had complaints after 1 year.

Permanent and temporary nerve injury has been described in other arthroscopic procedures as well. In ankle arthroscopy\textsuperscript{21} and knee arthroscopy,\textsuperscript{22} a 15\% rate of nerve injury has been described. In an electrophysiologic study of 17 patients undergoing anterior cruciate ligament (ACL) reconstruction with a hamstring graft, Figueroa et al.\textsuperscript{23} reported “hypoesthesia” in 77\% of operated knees by the time of follow-up (>1 year). In our study, the incisions for the anterolateral and the inferior midanterior portal were longitudinal and followed by blunt dissection.

The most common interpretation of nerve injury as a complication after HA is a combination of traction and compression. Although known nerve complications by direct lesion (neurotmesis) have been described in many other arthroscopic procedures, in HA literature is sparse. Clarke et al.\textsuperscript{2} described the overall rate related to nerve and vessel damage when entering the joint as low (0.6\%). Larson reported a rate of “postoperative sensory disturbance adjacent to the portals or involving the distal anterolateral thigh, consistent with the lateral femoral cutaneous nerve” of 22.7\% (C. Larson, personal communication, September 2012). Although it remains unclear how long these sensory disturbances lasted and if the patients or the surgeon reported them, the actual rates of nerve affection at the anterolateral thigh may be higher than previously reported.

We found symptoms of nerve dysfunction at the anterolateral thigh to be mainly located around the portals and they tended to be long lasting. All these patients had reduced sensation around the portals varying from 3 × 10 cm to 10 × 15 cm. None of these patients had a full lesion of the lateral femoral cutaneous nerve. Furthermore, the patients described these symptoms as negligible. We presume that these lesions were caused by a branch or branches of the lateral femoral cutaneous nerve being lacerated directly under portal placement or instrumentation (neurotmesis), or both, although we performed instrumentation with a standardized technique aimed at protecting nerves and vessels in the area. We made stab incisions only through the skin and used a switching stick or a half-pipe, or both, when changing instruments.

In the electrophysiologic study of Figueroa et al.,\textsuperscript{23} the average area of dyesthesia more than 1 year after ACL reconstruction was 36 cm\textsuperscript{2} (1 to 120 cm\textsuperscript{2}) and the patients were not impaired in daily life, although they were aware of “hypoesthesia.” Although the rate of nerve affection in the article of Figueroa et al. was higher, the size measured and the patients’ estimations were comparable to our findings.

As a secondary purpose, we studied the influence of traction time and did not find a relation between traction time and nerve dysfunction. The post-hoc analysis we made hypothesizing that symptoms of nerve dysfunction at the lateral thigh are not related to traction did not show any significant difference between the traction times of these 2 groups ($P > .518$). Erectile dysfunction has not been described after HA before but has been published as a complication after intramedullary nailing of femoral fractures.\textsuperscript{24,25} It is mainly transient but can affect up to 40\% of the patients undergoing femoral nailing.\textsuperscript{25} In our study, one patient had erectile dysfunction for approximately 7 weeks after surgery.

Overall, the patients were not impaired by these symptoms of nerve dysfunction; however, this might be influenced by the overall positive impact of the surgical FAI treatment and the postoperative rehabilitation and therefore considered of minor importance by the patients.

**Limitations**

The fact that the clinical evaluation of the nerve dysfunction was performed by orthopaedic surgeons and not by a neurologist or an independent reviewer and the fact that no electromyography was performed could be a limitation of the study. Although examined and interviewed within the first 3 months after surgery, the long-term results were based on a retrospective patient-reported questionnaire, and only patients with symptoms at the 1-year follow-up questionnaire were examined clinically. This might introduce a recall bias. Furthermore, other factors apart from surgical setup and traction time may influence the development of symptoms of nerve dysfunction. However, these were not examined in this study.

**Conclusions**

Forty-six percent of patients undergoing HA reported symptoms of nerve dysfunction within the first 6 weeks after surgery. One year postoperatively, these symptoms remained in only 18\% of all patients. Traction time during surgery was not different in patients with and those without symptoms of nerve dysfunction.

**References**