ORIGINAL ARTICLE

Pudendal nerve neuralgia after hip arthroscopy: Retrospective study and literature review

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KEYWORDS
Hip arthroscopy; Fracture table; Pudendal nerve; Complication; Neurapraxia

Summary
Introduction: Pudendal nerve neurapraxia is a classic complication after traction on the fracture table. Diagnosis, however, is difficult and often overlooked, especially after arthroscopy in traction on fracture table; incidence is therefore not known exactly.
Hypothesis: The study hypothesis was that incidence of pudendal nerve neuropathy exceeds 1% after hip arthroscopy.
Materials and methods: Results for 150 patients (79 female, 71 male) undergoing hip arthroscopy between 2000 and 2010 were analyzed retrospectively. The principal assessment criterion was onset of pudendal neuralgia. Secondary criteria were risk factors (history, surgery time, type of anesthesia), associated complications, onset to diagnosis interval and pattern of evolution.
Results: At a mean 93 months’ follow-up, there were 3 cases (2 women, 1 man) (2%) of pure sensory pudendal neuralgia; 2 concerned labral lesion resection and 1 osteochondromatosis. Surgery time ranged from 60 to 120 min, under general anesthesia with curarization. Time to diagnosis was 3 weeks. No complementary examinations were performed. Spontaneous resolution occurred at 3 weeks to 6 months. No significant risk factors emerged.
Conclusion: The present study found 2% incidence of pudendal neuralgia, with no risk factors emerging from analysis. Prevention involves limiting traction force and duration by using a large pelvic support (diameter > 8–10 cm). Patient information and postoperative screening should be systematic.
Level of evidence: Level IV. Retrospective study.
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Introduction

Pudendal neuropathy is a classic complication of orthopedic surgery involving traction on fracture table [1–3]. The physiopathologic mechanism is nerve compression of varying intensity. It should be suspected in case of onset of stereotypic perineal symptoms (sensory and/or sexual disorder) following orthopedic surgery involving traction on fracture table [4]. Evolution is generally favorable within 6 months of surgery, although definitive sequelae are possible [3]. Diagnosis, however, is difficult and may be overlooked. The present study hypothesis was that incidence is underestimated and in fact exceeds 1% [5]. The principal objective was therefore to describe the incidence of pudendal neuralgia following hip arthroscopy, and the secondary objectives were to look for risk factors and to determine the intervals to onset and to diagnosis and the type of resolution.

Material and methods

Patients

A retrospective study included all 150 patients in our center’s database (Fusion-CCAM software) who had undergone hip arthroscopy between January 2000 and June 2010. All patients were operated on by a single experienced surgeon (PC).

Procedure

Patients were placed in supine position on the fracture table (Alphamaquet1150®, Sweden) with both feet on a cushion. Moderate manual traction was exerted on the non-operated side, with a pelvic support of 5 cm before 2002, increased to 8 cm after 2002. The operated hip was positioned in 30° adduction-internal rotation-flexion. Under fluoroscopy, the iliac crest and trochanter were located, and limb traction was applied after anterolateral intra-articular injection of 20 cc of physiological saline using a Tuohy needle [6]. Traction was considered satisfactory when femoroacetabular de-coaptation reached 1 cm under fluoroscopic control.

Assessment

All medical files were reviewed and the patients were called to consultation. The principal assessment criterion was onset of pudendal neuralgia on the Nantes diagnostic criteria [7], comprising 24 clinical criteria compiled by an expert group of the French-language Interdisciplinary Urodynamic and Pelvic-Pеринéologie Society (Société interdisciplinaire francophone d’urodynamique et de pelvi-périnéologie) and the Perineal Electrophysiology Club (Club d’électrophysiologie périnale) (Table 1).

<table>
<thead>
<tr>
<th>Table 1 Nantes diagnostic criteria for Pudendal Neuralgia [8].</th>
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<tbody>
<tr>
<td>5 Essential criteria for the diagnosis of pudendal neuralgia by pudendal nerve entrapment</td>
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<tr>
<td>1. Pain in the territory of the pudendal nerve (from the anus to the penis or clitoris)</td>
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<td>2. Pain is predominantly experienced while sitting (relief of pain when sitting on a toilet)</td>
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<td>3. The pain does not wake the patient at night</td>
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<td>4. Pain with no objective sensory impairment</td>
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<tr>
<td>5. Pain relieved by diagnostic pudendal nerve block</td>
</tr>
<tr>
<td>8 Complementary criteria</td>
</tr>
<tr>
<td>1. Burns, shooting, numbness, stabbing pain</td>
</tr>
<tr>
<td>2. Alloodynia or hyperpathia</td>
</tr>
<tr>
<td>3. Vaginal or rectal foreign body sensation “sympathalgia”</td>
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<tr>
<td>4. Worsening of pain during the day</td>
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<tr>
<td>5. Predominantly unilateral pain on palpation of the ischial spine</td>
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<td>6. Pain triggered by defecation</td>
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<tr>
<td>7. Presence of exquisite tenderness (unilateral is suggestive)</td>
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<tr>
<td>8. Clinical neurophysiology findings in men or in nulliparous women</td>
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<tr>
<td>4 Exclusion criteria</td>
</tr>
<tr>
<td>1. Exclusively coccygeal, gluteal, pubic or hypogastric pain</td>
</tr>
<tr>
<td>2. Pruritus</td>
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<tr>
<td>3. Exclusively paroxysmal pain</td>
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<tr>
<td>4. Imaging abnormalities able to account for the pain</td>
</tr>
<tr>
<td>Associated signs not excluding diagnosis</td>
</tr>
<tr>
<td>1. Buttock pain and referred sciatic pain on sitting</td>
</tr>
<tr>
<td>2. Suprapubic pain</td>
</tr>
<tr>
<td>3. Urinary frequency and/or pain on a full bladder</td>
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<tr>
<td>4. Pain occurring after ejaculation</td>
</tr>
<tr>
<td>5. Dyspareunia and/or pain after sexual intercourse</td>
</tr>
<tr>
<td>6. Erectile dysfunction</td>
</tr>
<tr>
<td>7. Normal clinical neurophysiology</td>
</tr>
</tbody>
</table>

The secondary criteria were:

- history (smoking in pack-years, body-mass index (BMI), diabetes, arteriopathy, neurologic disorder, intervertebral discopathy);
- surgical date: indication, number of approaches, surgery time, curare dose;
- post-arthroscopy complications: interval to onset of neuralgia, time to diagnosis, type of neuralgia (sensory, motor, mixed; uni- or bi-lateral);
- complementary examinations and treatments;
- evolution: recovery and time to recovery, any sequelae;
- onset of other complications.

Statistics

Descriptive analysis was performed after assessing normal distribution of continuous variables on Shapiro-Wilk test and equality of variance on Fisher’s t test and the Levene test to ensure the applicability of parametric tests. Chi² tests were used for discrete variables. Impact of selected factors on onset of pudendal neuralgia was assessed by multimodal regression, giving relative risk of onset per factor. The significance threshold was set at 5%. Analysis used Stata SE v11.0 software (College Station, Texas, USA).

Results

Population

For the 150 patients, mean age was 48 ± 15.2 years (range, 17–75 yrs), mean BMI 23.21 ± 4.3 (range, 15–43); 79 patients (53%) were female. Mean follow-up was 93 ± 6.5 months (range, 24–148). There was no loss to follow-up.

Indications for arthroscopic surgery were post-traumatic articular foreign-body ablation in 27 cases, osteochondromatosis in 27 cases, and labral lesion resection in 42 cases. In 54 cases, arthroscopy was diagnostic, for hip pain: labral lesions were found in 22 cases (41%), advanced arthropathy in 27 cases (50%) and no clear etiology in five cases (9%).

Mean surgery time was 103 ± 7.8 min (range, 45–180 min). General anesthesia was induced in 145 cases, curarization in 137, and locoregional anesthesia in only five. A single anterolateral approach was used in most cases, with a second anterolateral approach needed in only eight. No anterior capsulotomies were performed.

Pudendal neuralgia

In the 150 patients, there were three cases of pudendal neuralgia (Table 2): two women aged 40 and 20 years and one managed 46 years at surgery (Table 1). In all three cases, clinical diagnosis was made by the surgeon: at 1 month for two and while in hospital for one. Neuralgia was pure sensory in all three cases, presenting mainly as perineal hypoesthesia and dysesthesia on the operated side, meeting the Nantes criteria. No complementary examinations were performed. All three cases resolved spontaneously without treatment in 3 weeks to 6 months. In all three cases, there was
associated gluteus medius enthesisopathy, presenting as isolated muscle insertion pain and quadriceps insufficiency (Table 2). BMI ranged between 21 and 27; the patients had no particular history. Indications for arthroscopy were laser labral lesion resection in 2 cases, chondroma ablation in osteochondromatosis in the other. Surgery time ranged between 60 and 120 min, systematically under general anesthesia and curarization. A one-way technique was applied in all three cases with an anterolateral approach by an arthroscope with axial instrumentation allowing simultaneous introduction of the arthroscope and operational canal. Pelvic support diameter was < 6 cm in two cases and > 8 cm in one. No significant risks factors for pudendal nerve involvement were found (Table 3).

Other complications

Complications associated with the pudendal neuralgia comprised:

- two cases of gluteus medius enthesisopathy presenting as isolated muscle insertion pain;
- two cases of pain at the anterior rectus muscle insertion to the anterosuperior iliac spine;
- one superficial coagulase-negative Staphylococcus infection on the surgical scar;
- one case of fibular collateral ligament ankle pain related to traction;
- two cases of sciatic neuralgia, confirmed electrophysiologically, responding within 1 month to simple analgesics;
- one technical failure requiring crossover to Huetter arthroscopy;
- one material breakage: shaver dent detected on control X-ray but not requiring surgical revision.

The rate of arthroscopy-related complications was thus 8.6%.

Discussion

Pudendal neuralgia is one of the most frequently reported complications following hip arthroscopy [3,8–10]. Diagnosis, however, tends to get overlooked, and incidence is often underestimated. The present study confirmed the hypothesis of an incidence greater than 1%: in fact, 2%.

The study involved certain limitations. Firstly, the number of cases (three) was small despite a large recruitment, making risk factors difficult to determine. The size of the recruitment, on the other hand, gave value to the incidence observed. Secondly, the one-way surgical technique was a factor of confusion with respect to the incidence of pudendal neuralgia, not being the standard arthroscopic technique. Finally, the retrospective design entails bias—a bias, however, tending to minimize the incidence of pudendal neuralgia, as some cases may have been overlooked and the symptoms concern an anatomic region that might offend the modesty of certain patients: nevertheless, the incidence observed exceeded 1%

The literature reports 0.9–25% incidence following hip arthroscopy [11–15] (Table 4). Numerous cases have also been reported in relation to traumatology and intramedullary nailing (Table 5): Brumback et al. [20] reported 0.94% incidence of pudendal neuralgia (10 cases out of 106 femoral intramedullary nailing procedures). Unfortunately, none of these reports specified the diagnostic method, and all were retrospective. There have been no reports based on perineal electrophysiological examination, which is, however, essential for definitive diagnosis of pudendal nerve trunk involvement [24]. Likewise, the present study lacked electrophysiological examination, but diagnosis was founded on a precise and validated clinical tool: the Nantes criteria [7].

The most frequently implicated risk factor is excessive traction [1,2,16,17,20,21]. It is also, however, the most difficult to study clinically, as few fracture tables come equipped with a dynamometer. The diameter of the vertical stem of the pelvic support (or perineal cushion) is often mentioned [1,18,21,25]; the relevance to applied traction is clear: the greater the diameter, the better the distribution of forces. The recommended cushion size is 8–10 cm [16,21,25], and it should ideally be placed between the healthy limb and the genitals [2,16]. Another means of reducing incidence of this complication is lateral decubitus positioning [26], associated with lower rates of neuropathy [21,27]; almost all reports, however, concern dorsal (181 cases) rather than lateral decubitus (15 cases) (Table 4). An external distractor might also be a useful alternative for prevention [28]. Regarding other risk factors, good muscle relaxation under general anesthesia has been highlighted [19,20]. Pudendal neuropathy is generally associated with greater age at surgery: a mean 46 years for five patients showing sequelae versus 30 years in 15 without sequelae [2,21]. Finally, surgery time is

| Table 3 Multimodal analysis of main risk factors for pudendal neuralgia (none found significant). |
|-----------------------------------|-----------------------------------|------------------|
| Pudendal neuralgia group (n = 3)  | No pudendal neuralgia group (n = 147) | P value |
| Weight (kg)                      | 73 (60–88)                        | 68.96 (42–105)   | 0.588 |
| Height (cm)                      | 176 (169–180)                     | 168.96 (148–190) | 0.163 |
| BMI                              | 22.44 (21.0–27.1)                 | 24.07 (15.7–43.8)| 0.785 |
| Gender                           | 2M/1F                            | 0.86M/1F         | 0.665 |
| Smoking (pack-yrs)               | 0                                | 2.08 (0–20)      | 0.434 |
| Diameter of public support       | 7.33 (6–8)                       | 6.93 (6–8)       | 0.652 |
| Surgery time (min)               | 100 (60–120)                      | 103.32 (40–180)  | 0.862 |

a classical risk factor [1,20]; in the present series, however, it was 103 min on average (range, 45–180 min) overall, and a mean 100 min for the three patients with neuralgia. For the purposes of comparison, mean surgery time for France and Aurori [2] was 130 min in 36 patients; for Kao et al. [20], 207 min (without neuralgia) versus 240 min (with) in 44 patients in one center and 190 versus 208 min in 19 patients in another (multicenter study). Even so, according to France and Aurori [2] surgery time is not a risk factor for pudendal neuralgia.

**Conclusion**

The present study found a 2% incidence of pudendal neuralgia. No risk factors could be determined, due to lack of power. Logically, however, prevention involves minimal traction and surgery time, and a large pelvic support. Patient information and postoperative screening should be systematic.

**Disclosure of interest**

No conflict of interest for Régis Pailhé, Nicolas Reina, Etienne Cavaignac, Valérie Lafontan or Jean-Michel Laffosse. Philippe Chiron declares no conflict of interest for the present study, but works as a consultant for Zimmer, Smith & Nephew and Sanofi and receives royalties from Zimmerand Integra.

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