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ORIGINAL ARTICLE

Joint infection after knee arthroscopy: Medicolegal aspects

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Summary

Introduction: Septic knee arthritis following arthroscopy is a rare but dreaded complication: it might compromise patients' functional prognosis and engage surgeon's liability. This study analyzes the context of such infection occurrences, their management as well as their medicolegal consequences.

Patients and methods: Twenty-two cases of knee septic arthritis following arthroscopy were examined during the medicolegal litigation process and collected for assessment from a medical liability specialised insurer. Half of the patients were manual workers who worked on their knees, and seven knees had a previous surgical history. The procedures performed at arthroscopy included seven ligamentoplasties, nine meniscotomies, three arthroscopic lavages, one arthrolisis, one chondroma removal and one plica resection. Seven patients, to some point, received corticosteroids: three preoperative joint injections, three intraoperative injections, and one oral corticotherapy.

Results: Clinical signs of septic arthritis appeared after a median interval of 8 days (0–37), twice after a hemarthrosis and once after an articular burn. The median delay before treatment initiation was 4.2 days, and in 10 cases this therapeutic delay exceeded 3 days. On average, 3.5 additional procedures (1–9) were required to treat the infection and its residual sequels. Two total knee prostheses were implanted. Only two patients were free of disabling sequellae, and in five patients these sequels affected their livelihood. The medicolegal consequences were a partially permanent disability averaging 5% (0–20), a total temporary work incapacity of 120 days (40–790), a suffering burden averaging 3 out of 7 (0–4,5) points on the scale conventionally used in France. Twelve of these legal claims led to court ordered patient compensation.

Discussion: Some risk factors of articular infection are known and well-identified. They can be linked to the patient's condition (addiction to smoking, surgical history, professional activity)

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or to medical management (intra-articular corticoid injections, interventions under oral anti-coagulants, inadvertently overheated irrigation fluid). When infection is suspected, it is often the needle-aspirated fluid's inappropriate handling (such as absence of bacteriological testing or defective waiting time for the results), which delays the diagnostic or therapeutic management of this complication. All failures of infection diagnosis or treatment heavily contribute to malpractice claims against the surgeon. Early and appropriate management of postoperative infections helps limiting the risk of functional sequellae for the patient and reduces the risk of malpractice litigation for the practitioner.

Level of evidence: Level IV; economic and decision analysis, retrospective study.

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Introduction

Knee arthroscopy is the most common orthopaedic procedure in France. It is recognized by surgeons as a procedure with a smooth recovery and complications "as reduced as the scars." As proof of this, the postoperative septic arthritis rate is normally under 0.2% [1,2]. The low infection rate at the operative site after arthroscopy could be attributable to reduced surgical approaches, lavage with irrigation fluid, and often a short operating period. However, this statement differs from the evaluation of the medical insurer. In a sample of 252 orthopaedic surgical complaints, the primary site of concern was the knee (26.4%), the primary knee complication being infection (42%), and of these infections, paradoxically, most followed arthroscopy (46%) rather than arthroplasty (27%) (internal Mutuelle d'assurance du Corps de santé français [MACSF] data). This inconsistency between the claim record and data from the literature led us to analyze the context of occurrence and management of septic arthritis following knee arthroscopy as well as their medicolegal consequences.

Patients and methods

This retrospective study involved 22 files of septic arthritis patients after arthroscopy submitted to the MACSF. All these files were examined as part of a medicolegal proceeding. The causes of action occurred between 1998 and 2004. In these expert reports, we studied the context of complication occurrence, the type and quality of management as well as the clinical and medicolegal consequences.

Population

This series regrouped 20 men and two women with an average age of 39.5 years (19 to 57 years). Body mass index was 24.5 (17 to 33.2). Half of the patients practiced a physical profession involving kneeling (construction worker, maintenance worker, mechanic, carpenter, etc.). Three patients performed a high-level sport (water-skiing, soccer, handball).

Comorbidities and histories

Seven patients were smokers, and three had serious medical histories (ASA II and III). One of them was operated

on while taking clopidogrel (Plavix®, Sanofi Aventis) and presented preoperatively with chronic folliculitis of the lower limbs.

Seven knees had been operated (once in six cases and eight times in one case); none had a local septic history.

Operative indications and evolution time frames

The operating indications were eight meniscectomies, seven ligament reconstructions, three diagnostic arthroscopies, two arthroscopic lavages, one chondroma removal and one arthrolysis.

Symptoms justifying arthroscopy were chronic in 18 cases. Four patients were operated in semiemergency situations for two meniscal locking knees (J₅ and J₁₅) and two ligament reconstructions of the anterior cruciate ligament (J₁₅ and J₂₅).

The first procedure was performed after a median waiting period of 18 days (5 to 63). The procedures performed were nine meniscectomies (associated once with a repair of the other meniscus and once with the resection of a popliteal cyst), seven ligament reconstructions (associated three times with a meniscectomy, once with a meniscal repair, once with medial ligament repair and once with synthetic reinforcement), three arthroscopic lavages, one plica resection, one chondroma ablation and one arthrolysis. All the ligament reconstructions included perioperative antibioprophyllaxis based on existing recommendations [3].

Corticosteroid use

Seven patients received corticosteroids: three intra-articular injections at the end of the procedure, three postoperative joint injections, and one oral postoperative corticotherapy.

Type of medicolegal proceeding

Jurisdiction was civil in 12 cases, ordinal in two cases, and administrative in one case. Four appeals were made to the "Commission régionale de conciliation et d'indemnisation", and three lawsuits followed conciliation proceedings.

Results

Time of infection

Infection always appeared early and presented clinically after a free median interval of 8 days (0 to 37). They consisted of 19 septic arthritis, two hemarthroses (including one in a patient operated under clopidogrel treatment) and one intra-articular burn due to overly hot irrigation fluid. The latter three cases also developed secondary infections. These infections were also associated with three thromboembolic outcomes (two phlebitis and one pulmonary embolism) and three side-effects of antibiotherapy, all regressive (one renal insufficiency, one neutropenia, and one hepatic cytolysis).

Management of infectious complications

The waiting period for therapeutic management, once the infection was clinically suspected, varied from 0 to 24 days (median: 4.2 days). In 10 cases, management was delayed by more than 3 days:

- four surgeons had waited for the bacteriological results before performing arthroscopic knee lavage, although the fluid from needle aspiration was purulent or clinical signs were obvious;
- three aspiration fluids were not sent to bacteriology for analysis.

A diagnosis was not made for a weeping scar on a painful knee and the patient was put on corticosteroids by his general practitioner:

- in one case, a deep sample was not taken (the only case with negative bacteriology);
- a surgeon left after hospitalizing his patient for septic arthritis and operated on him only after his return.

In five cases, the intervention of another practitioner for the initial management of the complication may have been harmful: prescription of corticosteroids, absence of needle aspirate analysis, surgical treatment report. However, the practitioners who delayed arthritis management were not the subject of any legal consequence.

Bacteriological testing

Staphylococcus was isolated 20 times (14 *Staphylococcus aureus* and six coagulase-negative *Staphylococcus*) and *Streptococcus* three times. Two infections were bimicrobial. Only one bacteriological test was negative: it included only one scar sample, with no deeper sample, although the patient was treated for 3 months with double antibiotherapy.

Treatment of the infection and sequelae

The median duration of antibiotherapy was 3 months (1 to 4 months). On average, 3.5 additional procedures

(1 to 9) were necessary for treating the infection and its sequelae.

The anti-infection procedures included 26 diagnostic and drainage punctures, 22 arthroscopic lavages, 11 synovectomies on eight knees (including four arthrotomies), three ligament transplant removals, one screw ablation, one debridement, one surgical biopsy, one ablation of skin necrosis followed by a cover flap and a skin graft.

Additional functional procedures included seven articular manipulations under general anaesthesia, one valgus tibial osteotomy, and two total knee prostheses. These two total knee prostheses were implanted in two patients aged 47 and 48 years, respectively, who were initially operated by knee arthrolysis for fracture sequelae and a ligament reconstruction with meniscectomy.

Physical, sports and professional sequelae after healing

Two patients were free of any functional after-effects. All the others suffered mainly from various degrees of arthritis, expressed by pain, stiffness or limited walking distance. Four knees were unstable, two patients walked with a cane, six suffered from algodystrophy and three from depression. The three high-level athletes stopped their physical activity, and five patients had major professional repercussions (one dismissal, two stopped their professional activities, one "workers-compensation board COTOREP" mandated retirement, one position was adjusted). The two knee prostheses remained painful.

Medicolegal assessment of injury

The medicolegal consequences were one median partially permanent disability (PPD) of 5% (0 to 20). Seven patients had a PPD greater than or equal to 10%. The duration of total incapacity for work varied between 40 to 790 days (median: 120 days). The suffering endured was between 0 and 4.5 (median: 3) on a scale of 0 to 7, and cosmetic damage was between 0 and 3 (median: 0.5) on a scale of 0–7.

Conclusions of medicolegal proceedings

In 10 cases, no fault was upheld against the practitioner or the health care institution. Twelve cases resulted in patient compensation: in six cases, the liability for infection was shared between the surgeon and the health care facility, and in six other cases, it was exclusively borne by the health care facility.

Discussion

Infection of the operating site in orthopaedics, and more specifically in arthroscopy, remains a rare event. Some risk factors for infection are, however, known and identified in this series. Related to the patients themselves is perioperative smoking addiction that doubles or triples the risk of postoperative infection [4]. In this series, one third of the subjects smoked, which is close to the rate in the general population. The risk is controllable and reversible.

Revision surgery (seven knees) and complex procedures adding several surgical procedures (eight cases) increase the infection risk at the operative site [5–10]. Only Van Tongel et al. [11] do not regard surgical histories as a risk factor.

Analysis of professional activity is more surprising and subtle to interpret. It shows that half of the patients often have to work on their knees. This characteristic could be interpreted in three ways:

- it could be a clinical selection bias, since protracted and repeated kneeling is most often the purveyor of articular lesions and pain;
- it could be a legal selection bias, as the functional sequelae caused by an infectious complication would be less tolerated professionally in these manual workers, which encourages them to obtain compensation for damage;
- it could be a cutaneous predisposition to infection due to repeated microtraumas or particle incrustations in the dermis, as in manual workers whose hands are constantly dirty despite repeated washings. Preoperative skin cleansing protocols are probably less effective on such particularly contaminated and microtraumatized skin.

The latter assumption could promote the reinforcement of skin preparation or antibioprophyllaxis protocols for this patient category.

Risky procedures by surgeons in this study include some questionable indications for diagnostic arthroscopies or arthroscopic lavages, a procedure performed with the patient on clopidogrel and the use of overly hot irrigation fluid responsible for articular burn. Perioperative corticosteroid treatment (seven cases) is also a risky practice. It has been questioned since the 1990s because it increases the postoperative risk of infection by reducing local immunity. It also decreases the clinical signs of infection, increasing the risk of diagnostic error. The risk of infection could be multiplied by 20 after corticosteroid use [5,12–14]. Corticosteroids should no longer be administered perioperatively.

These risk factors of infection can often be identified and sometimes controlled. When they are present, information about infection risk must be reinforced. All surgeons must give patients true, clear and appropriate information about serious risks of proposed care, even if these risks are minimal or rare. This information must help patients give their free and informed consent for the treatment they must undergo or have the possibility of rejecting it while understanding the risks involved.

Health care practitioners are also obligated to provide their patients with conscientious and attentive care based on scientifically-acquired data at the time of care, and calling on competent third parties, if necessary (Article 32 of the Code of Medical Ethics). It is the practitioners' responsibility to provide quality infection management with proper means. Practitioners can become liable for postoperative infection if the diagnostic procedures or management of the complication do not comply with "good practice standards", i.e., compliance with consensus recommendations on the subject. The diagnosis and management time frame are especially important because a possible therapeutic delay is potentially injurious.

In our study, appropriate complication management was delayed by an additional 3 days in 10 cases. During the

diagnostic phase, poor articular needle aspirate management was often found in cases of diagnostic or therapeutic delay: either the aspiration was not performed when there was clinical and biological evidence of articular infection, or the aspirate was not sent to bacteriology when it was described as macroscopically clear, or, again, the aspirate analysis result was expected before articular lavage was performed, even if the liquid was purulent.

Given a suspicion of infection after arthroscopy, it seems good practice to us to aspirate all postoperative knees presenting with unusual or febrile, painful liquid effusion. In fact, blood test anomalies (polynucleosis, high C-reactive protein) must be interpreted within the context of a recent procedure [15,16], but the purpose of the aspiration is to take possible infection into consideration. The liquid must be systematically analyzed in bacteriology, even if it is macroscopically clear (cytology, direct examination and cultures). If it is purulent or the clinical and biological arguments are sufficiently convincing, the knee must be washed under arthroscopy without waiting for the result of bacteriological sampling; synovectomy is eventually performed. Probabilistic antibiotherapy is started immediately after needle aspiration, then adapted according to the sample results [17–19]. The waiting period for management is all the more important as it determines the lesional and then the functional prognosis of the knee [17]. In fact, experimentally, structural lesions of articular cartilage appear within the first hours after an infection begins, and appropriate antibiotherapy, started before 24 h helps reduce collagen lesions by 37% [20]. Macroscopic cartilage lesions appear as of day 5 [21].

All the literature data agree on early infection management. McAllister et al. [7], Judd et al. [9], Schultz et al. [10], Van Tongel et al. [11], Indelli et al. [18], Schollin-Borg et al. [22], and Fong [23] have shown that it is possible to preserve an anterior cruciate ligament transplant after septic arthritis if it is diagnosed and treated early and appropriately from the beginning. In case of transplant preservation, a poorer functional result would be due to cartilaginous lesions caused by the infection and not to transplant failure [7,9,22]. Finally, Schultz et al. [10] also found more significant articular lesions when the management time frame was protracted, requiring more aggressive surgery.

Intervention by practitioners other than surgeons also could have been damaging during this initial phase, by not being aware of the septic arthritis diagnosis or by delaying its management (five cases). In no case was fault attributed to these doctors. This promotes the self-management of one's patients' complications in the initial diagnostic phase and providing systematic follow-up of all one's postoperative patients. In half of the cases, arthritis treatment was handed over to another team at various times of the complication's evolution. It is undoubtedly preferable to delegate the management of a complication to a specialized multidisciplinary team in the event of an insufficient technical stage (microbiology, infectiology, etc.), which does not exclude maintaining patient confidence.

In the literature data on this subject, the analysis conducted by Armstrong et al. [5] based on 24 cases is particularly noteworthy. They list the following as risk factors: male sex, a long operative procedure, multioperated knees, complicated technical procedures, and the use of

articular corticosteroids. They make six practical recommendations:

- long-acting corticosteroids must be prohibited in the perioperative stage;
- all patients with abnormal pain and swelling after arthroscopy must undergo needle aspiration, and the liquid analyzed regardless of the presence of erythema, fever, hyperleukocytosis or clear liquid;
- *coagulase-negative Staphylococcus* could be responsible for septic arthritis after arthroscopy and must not be routinely considered a simple contaminant;
- arthroscopic lavage is an appropriate technique for the surgical treatment of early postoperative septic arthritis;
- 2 weeks of intravenous antibiotherapy are sufficient if it is started early;
- continuous irrigation-lavage is not necessary.

Our study and our experience help to modify and complete these recommendations. It is important:

- to inform patients of the complication risk, because arthroscopy is not a harmless procedure;
- to give proper postoperative care to manual workers who work on their knees;
- to avoid corticosteroids perioperatively;
- to not ignore the possibility of infection after arthroscopy and to set up patient follow-up consequently;
- to aspirate the knees of all patients who experience abnormal pain or fever after arthroscopy. Aspiration is never wrong. The liquid must be analyzed regardless of its appearance and regardless of the blood sample results. Coagulase-negative staphylococcus can be responsible for septic arthritis after arthroscopy and must not be routinely considered a simple contaminant;
- to begin intravenous probabilistic antibioprophyllaxis as soon as the needle aspirate is taken, and then secondarily to adapt it to the infectious agent;
- to perform arthroscopic lavage, the surgical treatment of choice in emergency;
- to avoid continuous irrigation lavage.

The medicolegal consequences of septic arthritis after arthroscopy have not been described until now. According to the deficiency assessment scale [24], flexion stiffness can be rated at up to 20% of PPD and anterior laxity at up to 10%. In our study, PPD was rated between 0 and 20%, and seven patients had PPD over 10%. Two knee prostheses were implanted with a mediocre functional result. This study clearly shows a selection bias since the importance of functional sequellae after a complication encourages patients to demand compensation for damages, and we undoubtedly analyzed the most serious cases. However, the functional deficit related to infection is not all that insignificant, as cohorts of infected patients regularly have poorer functional results [7,9,10,22]. Finally, many knee prostheses had to be implanted as a result of this complication [10,15].

Twelve cases resulted in patient compensation. Liability must be shared between the surgeon and the health care facility, or exclusively borne by the health care institution. It must be emphasized that this study includes a period of legislative reversal concerning compensation for

patients who are victims of medical accidents. Until 1996, jurisprudence in hospital-acquired infection had held health professionals or institutions liable only in the case of established fault. If the plaintiff could not show fault, she/he was not entitled to any compensation. In May 1996, the Court of Cassation reversed the burden of proof, since the practitioner and health care institution were presumed liable in case of hospital-acquired infection, unless absence of fault was proven. Then, in June 1999, the Court of Cassation introduced the obligation of safe results in the matter: to be exonerated from presumed liability, doctors and clinics must now provide proof of a foreign cause, which is rarely possible. They were, therefore, almost systematically responsible, despite the absence of fault with respect to hospital-acquired infection. The law of March 4, 2002 [25] establishes a new liability program for hospital-acquired infections (applicable to acts subsequent to 5 September 2001): doctors are liable only in the case of proven fault, or for breach of duty in providing information about the risk of hospital-acquired infection, or for breach of obligation of means (delayed screening for hospital-acquired infection, treatment not complying with "scientific data", absence of antibioprophyllaxis conforming with an existing consensus, lack of asepsis, etc.). In the absence of fault ascribed to the practitioner, health care facilities remain "liable for damages resulting from hospital-acquired infection unless they can prove a foreign cause". The presumption of proof and obligation of safe results remain for health care facilities. Finally, this law, in the absence of the doctor's or facility's liability, allows for redress of the patient's grievance in the name of national solidarity as it exceeds the threshold for specific seriousness (PPD > 25% or death).

Conclusion

Septic arthritis of the knee after arthroscopy is a rare but dreaded complication, which impacts the patient's functional prognosis and the surgeon's liability. Early and appropriate management of postoperative infection helps to limit functional sequellae for the patient and medicolegal proceedings for the practitioner. The surgeon remains liable in the case of a lack of information or an anomaly in the diagnostic or therapeutic management of the complication.

Conflict of interests

None.

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