Case Report

Recurrent Spontaneous Hemarthrosis After Total Knee Arthroplasty Successfully Treated with Synoviorthesis

George A. Kapetanos, MD, Kyriakos A. Papavasiliou, MD, Vassilios Makris, MD, Anastasios P. Nikolaides, MD, John M. Kirkos, MD, and Panayotis P. Symeonides, MD

Abstract: A case of spontaneous recurrent hemarthrosis—due to developed hypertrophied synovium—after total knee arthroplasty is reported. The patient was successfully treated with radiosynovectomy. The first hemorrhage occurred 18 months after the total knee arthroplasty. Several similar episodes followed over a period of 4 years. Because conservative treatment failed to control the bleeding, an arthroscopic lavage was performed, which revealed the existence of proliferative synovium. A significant part of the hypertrophic tissue was excised with the use of a thermocoagulator. However, 1 month later, another episode of hemarthrosis occurred. As a final step before reoperation, the patient was treated with intra-articular injection of ytrium 90. Eighteen months later, she remains symptom-free, is very satisfied with the result, and reports no new episode of hemarthrosis. **Key words:** total knee arthroplasty, spontaneous recurrent hemarthrosis, arthroscopy, synoviorthesis, radiosynovectomy.

Case Report

A 50-year-old white woman with severe knee osteoarthritis—secondary to knee instability—underwent total knee arthroplasty (TKA) with the use of a constrained type of knee prosthesis 4 years ago. The patient initially did very well. However, 18 months postoperatively, an acute spontaneous and painful knee effusion occurred in her right knee. After aspiration of around 200 mL of blood, the patient felt immediate relief. She was further treated with the usual conservative measures. During the following 6 months, another 5 episodes of spontaneous hemarthrosis occurred. Three of them required joint aspiration. These episodes were followed by a 22-month symptom-free period. During the last 2 months, before her initial visit to our outpatient clinic, she experienced another 3 similar episodes.

Upon her initial examination at our outpatient clinic, her knee was moderately swollen, the movements (especially flexion) were painful, and the range of motion was limited to 40° (0°-40°). No clinical signs of infection were apparent. All her blood test results were within normal range. The technetium bone scan that was performed did not reveal any signs of local infection. Her evaluation by

From the Third Orthopaedic Department, Aristotle University of Thessaloniki Medical School, Papageorgiou General Hospital, Thessaloniki, Greece.
Submitted September 7, 2006; accepted July 23, 2007.
No benefits or funds were received in support of the study.
Reprint requests: Kyriakos A. Papavasiliou, MD, Third Orthopaedic Department, Aristotle University of Thessaloniki Medical School, Papageorgiou General Hospital, 3 Natalias Mela str, 546 46 Thessaloniki, Greece.

0883-5403/08/2306-0022$34.00/0
doi:10.1016/j.arth.2007.07.012

a hematologist uncovered nothing pathologic, and the results of performed triplex ultrasonography and digital arteriography were also normal.

As a next step, an arthroscopy was performed. It was a technically demanding procedure because of the constrained type of the implanted prosthesis. A tourniquet was initially used. After thorough lavage of the knee joint, no visible signs of bleeding were apparent. The synovium was found to be hypertrophied with signs of hemosiderin staining. A significant part of the hypertrophic tissue was excised with the use of a thermocoagulator. The release of the tourniquet did not expose any active bleeding spot. The tests performed on the bloody fluid that was aspirated during the insertion of the arthroscope revealed nothing but the existence of heavy red blood cells. The possibility that pigmented villonodular synovitis could be the cause of the repeated bleeding episodes was strongly considered, but nevertheless (although the pathologist was informed about this clinical suspicion), the performed biopsy did not reveal anything but the existence of chronic synovitis with fibrosis and hemosiderin staining.

The patient remained symptom-free for a period of only 1 month. Before proceeding to exploratory arthrotomy and synovial excision, we decided to perform (as a final step) synoviorthesis with the use of yttrium 90 (Y-90) citrate, to (possibly) avoid reoperating on the patient. The aim was to diminish the size of the proliferative synovium that was probably the actual cause of the recurrent bleeding and to cauterize any bleeding vessel. The protocol that was implemented was the typical used when Y-90 is used for the treatment of other synovial pathology. The knee was once again aspirated and then injected with 6.5 mCi (240.5 MBq) of Y-90 citrate with the use of a 20-gauge needle. The track was flushed with 5 mL of corticosteroid on withdrawal of the needle to diminish the risk of an acute inflammatory response and to prevent radiopharmaceutical skin contamination during the removal of the needle. The patient followed a program of gradual mobilization during the 1 month after the injection. Eighteen months after the synoviorthesis, she remains symptom-free and is extremely satisfied with the result of her treatment.

Discussion

Recurrent hemarthrosis after TKA is a rare but not uncommon complication. It has been reported so far in 49 patients. The first episode of hemarthrosis usually occurs at a mean of 20 months postoperatively (range, 6 months-6 years). Our patient's first episode occurred 18 months postoperatively. Its commonest cause is the development of proliferative synovium that is usually trapped between the TKA components [1-5]. Hematologic disorders [6] and vascular (usually transoperative) complications [2,7-12] are found less frequently. Pigmented villonodular synovitis has also been reported as a causative factor [13]. Our patient did not have any hematologic disease or a vascular injury. A biopsy confirmed the absence of any specific pathologic entity. After excluding all other possibilities, the existence of proliferative synovium was considered as the most probable cause of the recurrent bleeding. Recurrent hemarthrosis after TKA is treated either conservatively or operatively (the latter when conservative measures fail to control the bleeding or when a vascular complication has occurred).

The clinical use of neutron-rich, artificially produced radionuclides for therapeutic interventions is a well-established and rapidly growing method of treatment that has been shown to be an effective means for the treatment of many patients with orthopedic-related diseases and disorders (eg, pain from osseous metastases, recurrent hemarthrosis, and chronic synovitis due to hemophilia or rheumatoid arthritis) [14].

Surgical synovectomy ("open" or arthroscopically performed) is the standard method of treating intractable rheumatologic joint disease. Disadvantages include the risk of complications from anesthesia, prolonged hospitalization after the procedure, rehabilitation of up to 6 months, and, frequently, loss of motion as the outcome [14]. Radiosynovectomy provides an attractive alternative to that procedure because it requires no hospitalization and offers results equivalent to those for surgery with less cost. Furthermore, it can be repeated. The use of Y-90 as a means of synoviorthesis was initiated in the early 1970s as an alternative to gold 198 (Au-198). Yttrium-90 is a pure beta emitter with a physical half-life of 64 hours. It has the advantage of a higher energy (2.27 MeV) and a greater maximum synovium penetration than Au-198 (11 vs 4 mm). Furthermore it is safer than Au-198 [14-16]. The dose of the injected Y-90 greatly depends on the volume of the joint, the synovial thickness, and the patient's body size. It usually ranges between 5 mCi and 12 mCi (185-444 MBq) [17]. According to the best of our knowledge, this is the first report of a patient with recurrent hemarthrosis after TKA that has been successfully treated with synoviorthesis.

Because, in most of the cases, the actual cause of recurrent hemarthrosis after TKA is the development

of proliferative synovium, synoviorthesis (a safe, efficient, and cost-effective procedure that targets and diminishes the volume of exactly that hypertrophied synovial tissue) may be an attractive alternative to open or arthroscopically performed synovectomy. The time passed since the performance of the synoviorthesis is not adequate to accurately and firmly judge the usefulness of this method in similar cases. However, it is our belief that in the future, synoviorthesis may play a potentially significant role in the treatment of recurrent hemarthrosis after TKA that is caused by the development of proliferative synovium.

Acknowledgment

We would like to express our gratitude to Professor N Karatzas, Chairman of the Department of Nuclear Medicine, Aristotle University of Thessaloniki Medical School, Papageorgiou General Hospital of Thessaloniki, Greece.

References

1. Ohdera T, Tokunaga M, Hiroshima S, et al. Recurrent hemarthrosis after knee joint arthroplasty: etiology and treatment. J Arthroplasty 2004;19:157.
2. Pham TT, Bouloudian S, Moreau PE, et al. Recurrent hemarthrosis following total knee arthroplasty. Report of a case treated with arterial embolization. Joint Bone Spine 2003;70:58.
3. Worland RL, Jessup DE. Recurrent hemarthrosis after total knee arthroplasty. J Arthroplasty 1996;11:977.
4. Oishi CS, Elliott ML, Colwell Jr CW. Recurrent hemarthrosis following a total knee arthroplasty. J Arthroplasty 1995;(Suppl 10):56.
5. Kindsfater K, Scott R. Recurrent hemarthrosis after total knee arthroplasty. J Arthroplasty 1995; (Suppl 10): 52.
6. Malhotra R, Bhan S, Kiran EK. Haemarthroses after total knee arthroplasty caused by an isolated platelet factor 3 availability defect. J Bone Joint Surg Br 2005; 87:1549.
7. Sharma H, Singh GK, Cavanagh SP, et al. Pseudoaneurysm of the inferior medial geniculate artery following primary total knee arthroplasty: delayed presentation with recurrent haemorrhagic episodes. Knee Surg Sports Traumatol Arthrosc 2006;14:153.
8. Maheshwari R, Kelley SP, Langkamer VG, et al. Spontaneous recurrent haemarthrosis following unicompartmental knee arthroplasty and its successful treatment by coil embolisation. Knee 2004;11:413.
9. Katsimihas M, Robinson D, Thornton M, et al. Therapeutic embolization of the genicular arteries for recurrent hemarthrosis after total knee arthroplasty. J Arthroplasty 2001;16:935.
10. Cunningham RB, Mariani EM. Spontaneous hemarthrosis 6 years after total knee arthroplasty. J Arthroplasty 2001;16:133.
11. Langkamer VG. Local vascular complications after knee replacement: a review with illustrative case reports. Knee 2001;8:259.
12. Pritsch T, Parnes N, Menachem A. A bleeding pseudoaneurysm of the lateral genicular artery after total knee arthroplasty—a case report. Acta Orthop 2005;76:138.
13. Ballard WT, Clark CR, Callaghan JJ. Recurrent spontaneous hemarthrosis nine years after a total knee arthroplasty. A presentation with pigmented villonodular synovitis. J Bone Joint Surg Am 1993;75:764.
14. Siegel HJ, Luck Jr JV, Siegel ME. Advances in radionuclide therapeutics in orthopaedics. J Am Acad Orthop Surg 2004;12:55.
15. Vuorela J, Sokka T, Pukkala E, et al. Does yttrium radiosynovectomy increase the risk of cancer in patients with rheumatoid arthritis? Ann Rheum Dis 2003;62:251.
16. Falcon de Vargas A, Fernandez-Palazzi F. Cytogenetic studies in patients with hemophilic hemarthrosis treated by 198Au, 186Rh, and 90Y radioactive synoviorthesis. J Pediatr Orthop B 2000;9:52.
17. Boerbooms AMT, Buijs WC, Danen M, et al. Radiosynovectomy in chronic synovitis of the knee joint in patients with rheumatoid arthritis. Eur J Nucl Med 1985;10:446.