Rehabilitation Outcome of a Case of Pigmented Villonodular Synovitis

Pages with reference to book, From 242 To 245

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Pigmented villonodular synovitis (PVNS) is an uncommon proliferative disorder of the synovium, with an annual incidence of 1.8 per million[1]. PVNS may have no symptoms, or may present as pain, stiffness, or swelling in a joint, with locking and instability[2]. The proliferation of synovial villi and fibrous nodules characteristic of PVNS may occasionally form a palpable intra-articular mass[3]. Resection of the lesion and total synovectomy is the treatment of choice. We report a case of a patient with symptomatic PVNS of the knee who underwent total synovectomy and cemented total knee arthropiasty. After rehabilitation, she was able to successfully return to work and was fully weight bearing without a limp. We believe thata rehabilitation plan focussing on total patient care and incorporating a six-step exercise programme and modalities to strengthen the quadriceps and hamstring muscles will help patients with PVNS of the knee achieve the goal of functional independence.

Case History

A 74 year old woman presented with swelling of her left knee joint. She reported having had left knee pain for 15 years. She had a history ofcarcinonia of the breast and had undergone a right radical mastectomy, had diabetes and hyperthyroidism and was taking tamoxifen, levothyroxine and glipizide. She was also taking nonsteroidal anti-inflammatory drugs for arthritis. Over a period of several years, the patient had undergone multiple arthioscopies of her left knee. Aspiration of her left knee joint on three occasions had revealed bloody fluid (results of coagulation studies were normal). A biopsy sample of the synovium of her left knee, obtained 2 weeks after initial presentation at her orthopaedic surgeon’s office, revealed focal proliferative changes in the synovium the presence of hemosiderin and calcification and scarring ofadjacent adipose tissue consistent with PVNS (Figure 1).

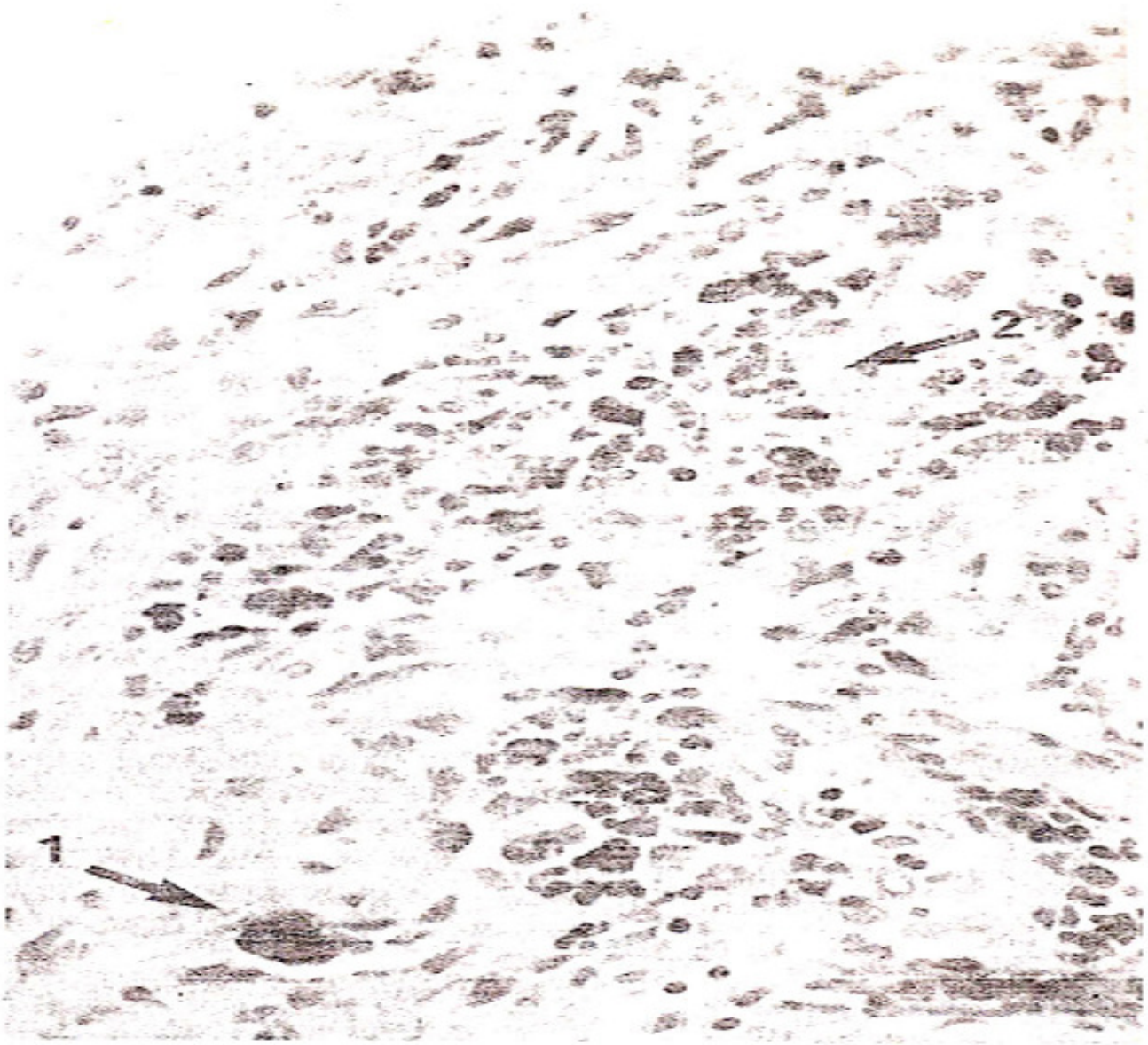

Figure 1(b). A biopsy sample of the synovium of the left knee of a 74 year old woman with pigmented villonodular synovitis of her left knee joint shows at higher magnification (Magnification 400x). Arrow 1 showing hemosiderin and arrow 2 showing calcification and scarring of Adipose tissue.

Roentgenogmphy showed osteoarthritis of knees bilaterally, more severe on the left side and slight medial displacement of the left femur relative to the tibia! plateau (Figure 2).

Figure 2. Osteoarthritic changes are seen in this roentgenogram of the left knee of a 74 year old woman with pigmented villonodular synovitis. Note the medial displacement of the femur over the tibial plateau.

Physical examination of the left knee revealed a range of motion restricted to 120 degrees of flexion and lacking 10 degrees of extension. She ambulated with a limp and pain, which limited her activities of daily living and prevented her from performing her occupation, operating a travel agency. It was decided that surgical treatment was necessary and total synovectomy and cemented left total knee arthroplasty were performed. Postoperatively, warfarin sodium therapy was stahed and the patient began range of motion exercises for her left knee; passive, 0 to 65 degrees and active, 12 to 60 degrees.

The physical therapy evaluation, performed on day2 postoperatively, showed that the patient was capable of tarsferring with minimal assistance, ambulating20 feet Limes two when using a pickup walker and was non-weight-bearing on left lower extremity, with fair endurance. Six days after surgery, the patient was admitted to Rehabilitation Unit. Multidisciplinaiy team treatment was initiated, which was provided by medical and nursing staff and personnel from physical, occupational, recreational and vocational therapy specialities, as well as, from nutrition and social services. Comprehensive patient care was started, with therapy sessions conducted for atleast 3 hours each day. The patient educated on her medical condition, self-care with hygiene grooming, pain and diabetic management and skin and incision-site care. The patient began using a continuous passive range of motion exercise machine, positioned at her bedside, for 2 to 3 hours a day or more, as toleraated. Exercise designed to increase the range of motion in the joint and strengthen the quadriceps and hamstring muscles was started (Table). Ciyotherapy was applied, as tolerated, to the left knee when the patient was in the gymnsium and in her xoorn. Manipulatory resistive exercises and NK table were started on the day of admission. In addition, electromyographic bio-feedback techniques were used to help the patient increase extension in the involved knee.

The staples were removed 21 days after the operation, a day before the patient was discharged home. At discharge her left knee active range of motion was 5 to 87 degrees and passive range of motion was 2 to 93 degrees, muscle strength was cour plus in her left knee, mobility was independent with axillary crutches for 150 feet times one, weight bearing as tolerated Posture, balance, and c endurance were good. Patient evaluation and conference system (PECS) [4] scores in eight rehabilitation medicine disciplines were 40 on admission and 4$ on discharge and were a perfect score of 56 at the 6 months check-up

After discharge the patient was givcna standard reacher and crutches and physical therapy sessions were conducted three times a week for 6 weeks at home. She was seen for follow-up visits at 6 weeks and 6 months after surgery. Her final active range of motion in the left knee was 0 to 110 degrees and she could walk with full weight bearing, without a limp, upto 500 feet usine a straight cane and for shorter distances without any assistive device. The patient returned successfully to her occupation; working part time for 2 months and then full-time.

Discussion

PVNS is an uncommon, inflammatoiy, diffuse proliferative disorder of the synovium. It is usually monoarticular and is commonly found in the knee[5,6]. The lesion is benignand slow growing, but can be locally invasive. PVNS occurs predominantly in adults and is of unknown cause[5,6]. The annual incidence ofPVNS is 1.8 permillion population', with the peak incidence for kneejoint disease occurring in the third decade of life[6]. The histologic appearance of PVNS is characterized by diffuse synovial proliferation, fibrous stroma, deposition of hemosiderin, histocytic infiltration and presence of giant cells (Figure 1). Clinically, PVNS may have no symptoms, orit can present with pain, stiffness and swelling of the affected joint, occasionally witha palpable mass[3], with locking and instability occurring in affected knees[2]. Aspiration of the knee can yield xanthochromic or brownish-coloured fluid. Pathological differential diagnosis includes non-specific synovitis/bursitis, synovial hemangioma, non-specific synovitis with focal hemorrhage, tuberculosis and rheumatoid arthritis. PVNS is diagnosed by aspiration of synovial fluid, arthroscopic observation and evaluation of biopsy samples. The most common radiologic finding in the knee is a soft-tissue swelling. An arthrogram may reveal the nodules as discrete, pitting defects, which may include erosions and degenerative changes in the bone. Magnetic resonance Ti and 12 weighted imaging of the affected soft tissue reveals areas of low signal within thejoint space, suggestive of hemosiderin deposition within the hypertrophied synovial

villi[7]. PVNS can cause erosion of the cartilages and can lead to joint destmction if not treated appropriately. Resection of the lesion and total synovectorny is the treatment of choice. In a study done by Ogilivie-Harris and colleagues[8] of patients with PVNS, the rate of recurrence was lower in those who had complete arthroscopic synovectomy compared to similar patients who had partial arthroscopic synovectomy. In the localized form of PVNS, local synovectomy with complete excision of the lesion should be performed[9,10]. Synovectomy is only effective when articularcartilage is preserved[11].

Rehabilitation

Five main modalities were used in upgrading the functional levels. First is the continuous range of motion machine, which is used at the bedside and which is operated at a very slow pace to allow the patient to increase range of motionwithout stress. Second is cryotherapy, which decreases local blood flow, metabolic activity, muscle tone, oxygen consumption and above all, is inexpensive. Third is bio-feedback through electromyography[12], which provides the patient with Instant visual and auditory feedback to facilitate the patient's appreciation of the smallest motor unit. Electromyographic feedback[13] can be used to help achieve relaxation of the hamstrings and recruitment of the quadriceps, or a combination of both and also works on knee and hip movement in different combinations of actions. The main purpose of electromyographic bio-feedback is to upgrade ambulation and increase range of motion it is also well suited as adjunctive therapy during most common exercises.The fourth modality is the NK table[14]

Table. Six-step exercise programme for rehabilitation after treatment of pigmented villonodular synovitis of the knee.

Step	Exercise name	Patient position	Description
1.	Quad sets	Supine, both legs straight	Knees pushed down (quadriceps tightened); position held for 5 seconds-relax
2.	Straight leg raise	Supine, uninjured knee flexed	Straight leg slowly raised and lowered
3.	Terminal knee extension	Supine blanket roll under thigh	Keeping thigh on roll, straighten knee (foot will raise slightly); position held 3 seconds, then lowered.
4.	Knee flexion/extension	Prone, towel pad under thigh just proximal to knee joint	Knee flexed slowly to maximum, then lowered
5.	Knee terminal extension	Prone, blanket roll under ankle	Shin pushed down into roll; position held for 3 seconds-relax
6.	Knee extension/flexion	Sitting on firm chair towel pad under thigh Just proximal to knee joint	Straighten knee as much as possible without raising thigh; position held for 3 to 5 seconds - relax

Instructions are for injured extremity unless otherwise noted. All exercise may be repeated as tolerated.

named after its manufacturers. It is an isotonic exercise machine used in the sitting position which helps the patient perform active, assisted range of motion and progressive resistive exercises to strengthen the quadriceps and hamstring muscles. In this case, weight was built upto 50 to 75 pounds; variation of angles of fiexion and extension can also be used. The fifth and last modality is the six-step exercise programme, which is explained in the Table. All six exercises may be repeated as often as the patient can tolerate. Patients should be cautioned against using bouncing or jerky movements when dot

1:’ these exercises. The patient ev aluation and conference system or other functional assessment scales, can be used to quantify the progress of patients using these modalities.

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