CASE REPORT

Vicious Cycle of Multiple Invasive Treatments in a Hemophilic Inhibitor Positive Child with Resistant Knee Flexion Contracture, A Case Report

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Abstract

Uncontrolled recurrent hemarthrosis can end to contracture, deformity, pain, joint destruction and gait disorders which are disabling. We are going to report a challenge, a unilateral knee flexion contracture in a child with severe hemophilia A and inhibitor who underwent different treatment options with unsatisfactory improvement of knee range of motion. Mismanaging postoperatively, patient and parents irresponsibility in managing self-care, lack of access and affordability to treatment and unavailability of proper treatment can be the reasons of recurrence in addition to the tough nature of a patient with inhibitor.

Keywords: Arthroscopy, Hemophilia A, Inhibitor, Knee flexion contracture, Manipulation under anesthesia, Radiosynovectomy, Supracondylar fracture

Introduction

Uncontrolled recurrent hemarthrosis can end to contracture, deformity, pain, joint destruction and gait disorders which are disabling (1). We are going to report a challenge, a unilateral knee flexion contracture in a child with severe hemophilia A and inhibitor who underwent different treatment options with unsatisfactory improvement of knee range of motion.

Case story

MY is an 8 year old boy with severe hemophilia A who was a challenge in our clinic. He was managed in a multidisciplinary hemophilia center, Joint Care Clinic, with experts in pediatric hematology, Orthopedic surgeon and hemophilia expert physiotherapist. He was born in October 2004 and diagnosed as hemophilic in October 2005 after spontaneous eccymosis. His parents were cousins and his parental uncle is affected with severe hemophilia A as well. First blood sampling for diagnostic tests resulted in large hematoma of right arm (20*10) for which factor VIII concentrate was used for the first time. The lab results showed PT=12.5, aPTT=112, BT=4.5, FVIII activity <1%. He had his first hemarthrosis in his right knee when he was 14 month old. In September 2006, suspicion came toward inhibitor formation as his mother stated "his response has decreased to FVIII and he better responses to Cryo". Therefore bleedings were being controled by Cryo ± Humate-P, and he had a considerable response to Humate-P. Laboratory investigation for inhibitor was done for several times which were negative, and so they were referred for more accurate lab tests. As long as the parents were totally non-compliant to be referred for more accurate lab tests, definite diagnosis of inhibitor was delayed for almost two years. Eventually, inhibitor diagnosis was made in 2008 which was 154 BU. During these years he experienced several episodes of hemarthrosis in both knees.

After diagnosis of inhibitor, treatment regimen changed to on demand rFVII (Novoseven®) plus prophylactic Humate-P two times a week. Having this treatment, inhibitor level decreased from 154 to 10 BU during the first year and bleeding episodes reduced significantly; however, continued rarely in right knee but more in left knee.

He used to recover his range of motion well in 5-6 days after each episodes of knee bleeding having rFVII treatment along with physiotherapy with modalities such as quadriceps exercise, patellar mobilization, TENS, pulsed Ultrasonography and passive ROM. In between hemarthrosis, he was also a normal boy in terms of walking, running, stair climbing and playing with siblings. The main problem started in 2012 when he was 8 years old. After a large hemarthrosis in his left knee, he could not gain the last 30 degrees of full active and passive extension again even after 50 sessions of physiotherapy which was the same as previous physiotherapies. On his examination, hypertrophied synovitis was obvious and he was hurt when passively forced to extend the last 30 degrees. Also mild quadriceps atrophy was present but no varus/valgus malalignment, posterior tebial shift, posterior drawer,

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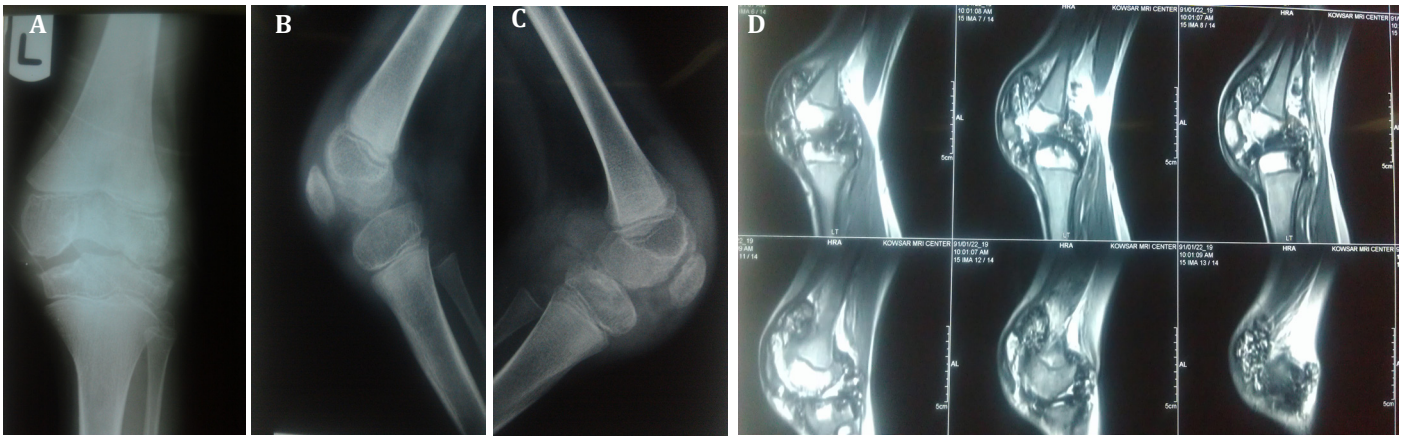

Figure 1. A. AP x-ray of an 8 year old boy with recurrent hemarthrosis. Notch widening and hypertrophied epiphysis are visible on x-ray.
B,C. lateral view of right and left knee of the same patient. Hyperdensity is visible around the left knee joint.
D. Left knee MRI showing hypertrophied synovitis throughout the knee joint.

Triceps surae shortening or decreased ankle dorsiflexion was seen on exam. Moreover, suprapatellar space was tender as well. According to examination and MRI, limitation of extension was related to the hypertrophied synovitis beneath the quadriceps tendon getting stuck into intercondylar notch. It was assumed to be the same as "patellar clunck sundrome" which happens as a complication after PS total knee replacement (Figures 1, A-D).

Since the knee flexion contracture did not improve, we planned an arthroscopic synovectomy. He got 0-120 range of motion back after the surgery; Postoperative protocol started on day two consisted of CPM, quadriceps strengthening and resting splint along with rFVII. However, he was non-compliant to resting splints and tended to keep the knee in flexed position. After 3 month, 30 degrees of flexion contracture recurred and he was unable to walk with left knee flexed. His right knee range of motion was otherwise full. Although he continued physiotherapy for the contracture recurrence, there was no improvement.

We were thinking of what to do whether a repeat arthroscopy or soft tissue release when femur fracture happened during physiotherapy. Although these fractures can happen and should always be suspected as soon as possible, but, they did not realize the break and it seemed that the pain was related to the extension exercise as usual. After 19 days, plain radiography was performed. As it was a dorsal apex angulation, we tried to closed reduce the fracture assuming as a supracondylar extension osteotomy to address the knee flexion contracture and taking the advantage of the osteotomy-fracture. Due to the exaggerated extension on fracture site, it was casted in 10 degrees of cast flexion with 40 degrees of extension at the fracture site for 4 weeks, but it was split on the first day post-reduction due to the reluctant pain. Despite of union, 30 degrees knee flexion contracture returned one month after cast removal and yet he was unable to bear weight with a normal gait (Figures 2, A-B).

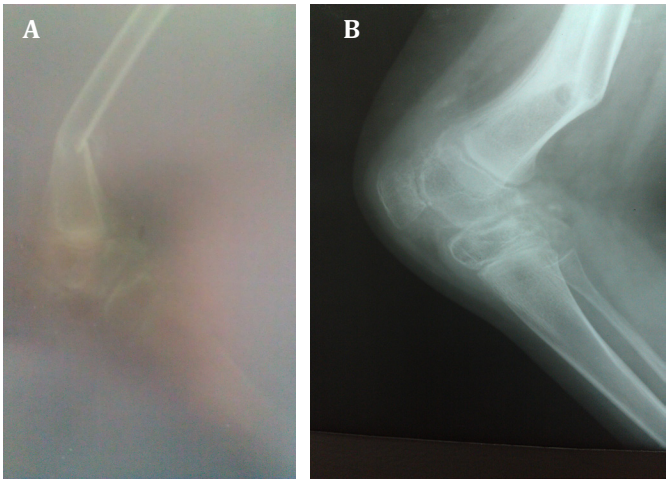

Figure 2. A. Distal femur fracture during forceful physiotherapy which was missed for 19 days.
B. taking the advantage of fracture to extend the knee.

For the next step, we decided to try radionuclide synovectomy. Rhenium-188 In colloid size from 2 to 10 microns and 555 Mgabkrl (15 mCi) was injected into the knee joint space and scanned under the camera to determine a proper injection (Figure 3, A-B). He experienced a mild pain after the injection but it did not last for more than a few minutes. The parents did not report any complications after that, however, no improvement was reported following too many sessions of physiotherapy. At this time, the range of motion was almost 5-10 degrees freezing in 30 degrees of flexion and extension contracture.

Facing the frustrated parents, we examined the patient to look for any hamstring contracture, but muscles were soft without any evidence of contracture. Discussing with the parents, we decided to do an arthroscopic release and synovectomy once more to gain "extension". Amazingly, under general anesthesia and before arthroscopic release, we could manipulate the knee from 5 degrees extension to 110 flexion. Then we continued the procedure with arthroscopic synovectomy. Unfortunately, huge hemarthrosis formed postoperatively despite of rFVII replacement. Factor replacement was according to the previous surgeries, but less responsive. Therefore, we had to open up all the bandage and splint and let him position his knee again in a comfortable flexion position for pain management. Moreover, we increased the dose and reduced the factor replacement interval. Bleeding was controlled after 4 days with 2 vials of Novoseven every 2 hours and then tapering to 1 vial every 4 hours with the total number of 55 vials of Novoseven and 3000cc of drainage collected in the closed drain bag. He started physiotherapy after eight days postoperatively.

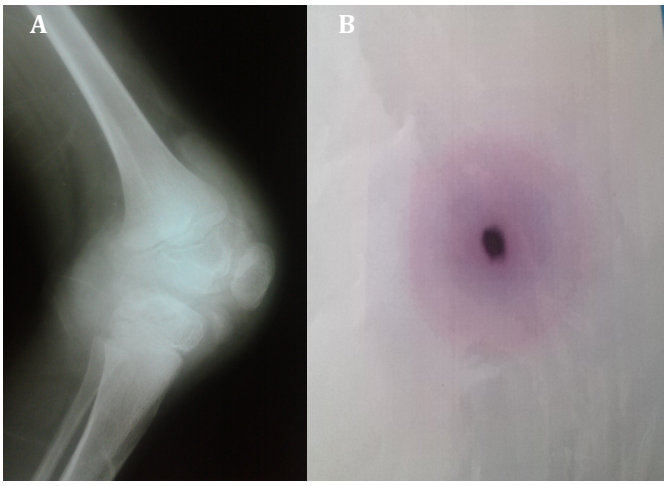

Figure 3. A: Hypertrophied synovium in a 9 year old hemophilic boy. B: Radionuclide camera scan showing proper injection inside the knee joint.

He is 9 years old now. Flexion posture remained in 20-30 degrees and he is still using crutches. According to parents report, his final condition has improved in terms of pain relief but the knee seems to be fibrosed in 30 degrees of flexion.

Discussion

Today's treatment principles are maybe the same as 20-30 years ago starting with conservative options before approaching to more invasive methods (2, 3).

To us, the lesson learned are outlined as below:

1. Inhibitor patients need a kind of "Prophylaxis (rFVIIa and/or aPCCS)" to avoid recurrent bleeding. Sometimes we could not get it in our patient due to patient and parents irresponsibility in managing self-care, lack of access and affordability to treatment and unavailability of proper treatment.
2. This recurrence could have been avoided by the means of orthosis in extension since extension contracture could be better tolerated.
3. Forced knee extension physiotherapy manoeuvres on a boy with hemophilia, inhibitor and recurrent knee bleeds should not be carried out. Forced manoeuvres are nefarious in (non- hemophilic) adults with shoulder capsulitis, therefore, why would one perform them on a pediatric patient with a bleeding disorder and inhibitor presence?
4. Perhaps we can hypothesize the boy may have been demonstrating pain-provoked muscle/joint protection spasms to the forced knee-extension manipulations during physiotherapy. Therefore, the knee could be ranged simply under anesthesia. Pain management may be a more efficient conservative treatment.
5. Surgery must always be the last resort. Radiosynovectomy might be worthwhile than surgery and we aim the ROM to reach full extension in addition to maximum possible flexion; Besides, maintenance with orthosis is of importance.
6. If surgery is necessary for failed conservative treatment, Arthroscopic synovectomy with "Immobilization Under Anesthesia" must be done to get full extension. Then recovered ROM must be maintained by the means of hematologic prophylaxis, physiotherapy and orthosis.
7. If supracondylar fracture occurs, we must take the advantage and fully extend the knee. It is better to walk on extended knee than crutches in flexion contracture.

Reviewing the literature for possible treatment options for hemophilic patients with knee flexion contracture, conservative treatments fall into 4 categories: proper factor replacement, physiotherapy, orthotic, and corrective devices (4). Surgical interventions fall into 4 categories: soft tissue release, supracondylar extension osteotomy, synovectomy, total knee arthropasty (5-10). There is a minimal invasive method in between conservative and surgical options which is synoviorthesis by radionuclide injection into the joint space. Moreover, to our knowledge, manipulation under anesthesia was not discussed anywhere which can be categorized as a non-invasive method.

During the past decade, reports showed encouraging results after injection in terms of bleeding episode and volume decrease, a little improved range of motion and burning hypertrophied synovium. However, Rodriguez-Merchan recommends surgical synovectomy after 2-3 unresponsive injection (11). Radionuclide injection indications are multiple joint involvement, inhibitor positive, advanced HIV and advanced hepatitis.

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