

Modified Thompson’s Quadricepsplasty with VY Lengthening of Vastus Lateralis for Stiff Knee

Rony Melhem^{1*}, Eliane Doumith², Mohamed L Lehreitani³

¹Orthopedic department, Rene Dubos hospital, Pontoise 95300, France

²Radiology department, Lebanese American University, Lebanon

³Orthopedic department, Rene Dubos hospital, Pontoise 95300, France

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*Corresponding author: Rony Melhem

Abstract

Case Report

Knee stiffness resulting from retraction of quadriceps muscle results in extended knee and limitation of flexion to varying degrees. This can be corrected by quadricepsplasty, which has several techniques. One of them is Thompson’s quadricepsplasty. Several modifications in Thompson’s quadricepsplasty have been tried previously to improve the patient outcomes in terms of improved flexion of knee without extension lag and to reduce complications. In our case report we did modifications in traditional Thompson’s technique and did VY lengthening of vastus lateralis and Z lengthening of fascia lata. The procedure was successful with no major complications and patient was able to walk normally with knee mobility from 0 to 100 degrees after one and half years from the procedure.

Keywords: Quadricepsplasty Vastus Lateralis.

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INTRODUCTION

Quadriceps femoris is the muscle located in the anterior aspect of thigh which is responsible for extension of knee. Retraction of this muscle can occur due to various causes like trauma, surgery, infection etc. Retraction can occur in one or more components of the muscle. Quadriceps retraction results in knee stiffness, where the knee remains extended and quadriceps fails to lengthen leading to limitation of flexion of knee for varying degrees. Stiff extended knee can also result from adhesions of capsule and synovial membrane. Knee stiffness results in severe disability since patients will not be able sit or squat. Hence it is essential to restore flexion movement without compromising the power to extend the knee [1-6]. Surgery is the main modality of treatment except in few cases where flexion

can be achieved more than 90 degrees. One of the common surgical procedures is quadricepsplasty, where adhesions and contractures in quadriceps muscle are released for improvement of flexion of knee. There are various techniques described by various authors for quadricepsplasty of which Thompson and Judet quadricepsplasty are most commonly performed [7-10]. Thompson’s quadricepsplasty may lead to skin necrosis and loss of full extension of knee [11]. In this case report, we have done modifications to the operative technique and the postoperative management so that post-operative complications are reduced and to achieve maximum range of movement.

CASE PRESENTATION



Fig-1: Clinical image showing flexion and extension of the knee joint



Fig-2: X ray of knee lateral view showed flattening of the femoral condyles

A female patient of age 22 years without any pathological antecedents came with complaints of right knee stiffness with pain for 11 years. Eleven years back, she had an injection in the right thigh following which she developed muscle retraction of quadriceps with knee stiffness. On examination, she was found to have a stiff knee with quadriceps amyotrophy. On examining the mobility, flexion of knee was achieved till 10 degrees. Knee was stable in the frontal plane and

kneecap was mobile, but pain was present on movement. Spinal examination and neurological examination were found to be normal. Ankle and foot were mobile.

X ray of knee showed flattening of the femoral condyles and high knee cap plated against the anterior aspect of femur (figure 1)

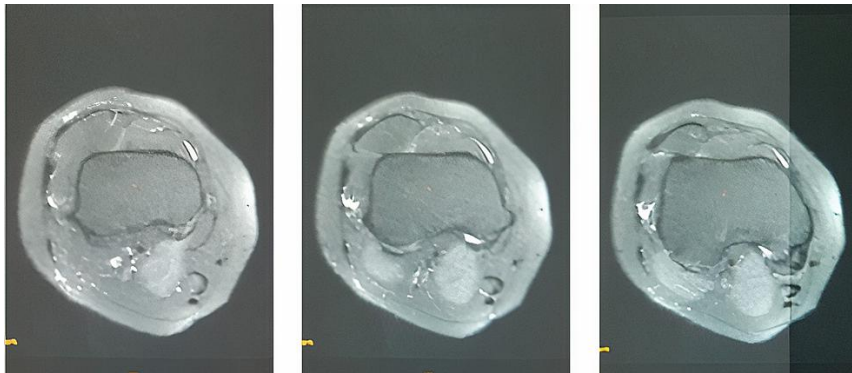


Fig-3: MRI of the knee showing flat surface appearance of lateral femoral condyle and lateral subluxation of the patella



Fig-4: MRI of the knee revealed complete wear of patellar cartilage and cartilaginous degradation at the femorotibial level

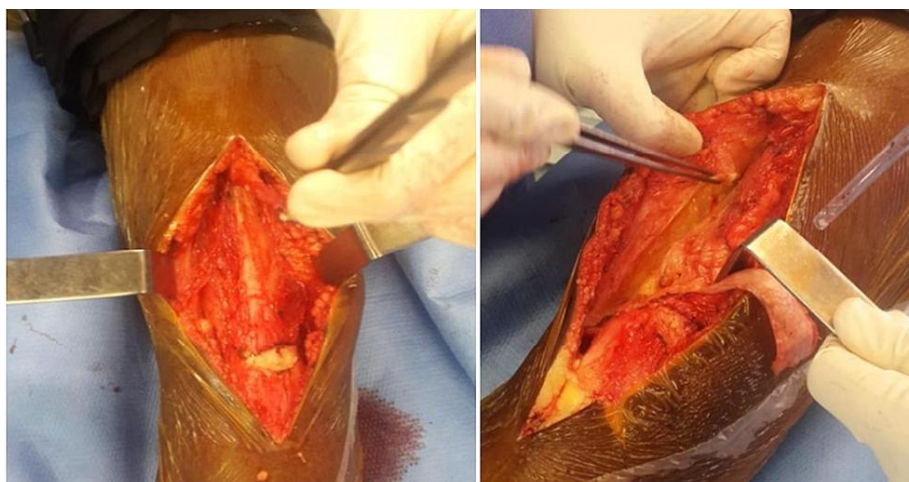


Fig-5: clinical image intra-operatively showing VY lengthening of vastus lateralis.

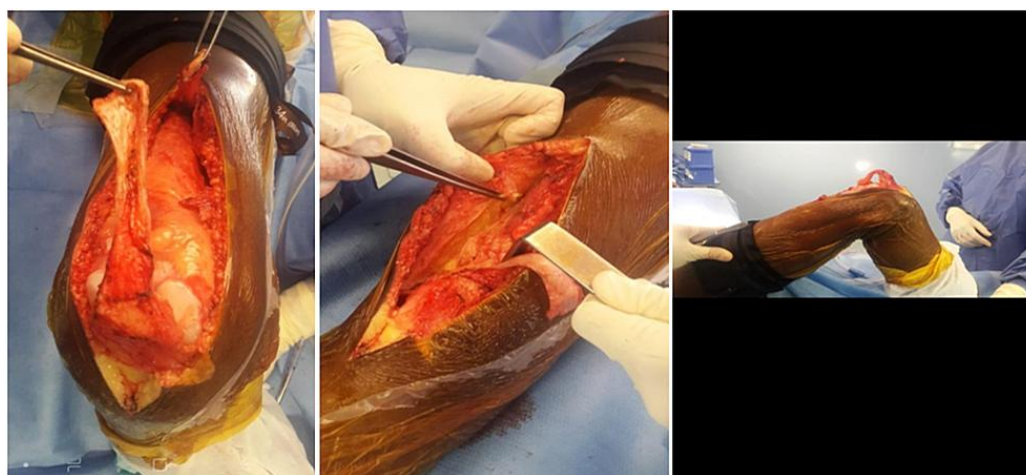


Fig-6: Intra-operative images showing passive flexion reaching up to 100 degree after quadriceps muscle release

MRI of knee revealed complete wear of patellar cartilage; cartilaginous degradation at the femorotibial level (figure 4); Flat surface appearance of lateral femoral condyle and lateral subluxation of the patella; integrity of all ligaments and meniscal structures; on the other hand, an almost complete wear of the patellar cartilage.

MRI of the thigh showed amyotrophy of the anterolateral compartment of the thigh with slight fat infiltration; no pathological lesion at the bone or muscular level. MRI of the spine revealed no abnormalities. EMG showed that there was no neurological abnormality that may explain this amyotrophy.

We concluded that it was a very old retraction of quadriceps which caused the growth disorders at the level of the femoral condyles resulting in irreducible stiffness. Patient noted that she was suffering from both pain and stiffness of her knee.

Different therapeutic possibilities were discussed with the patient ranging from abstention to knee fusion. It was finalised to perform a simple

operation to release the quadriceps with lengthening to earn the maximum possible knee flexion. We explained to the patient that the intervention was could enhance patellar instability due to the flat condyles and full flexion could not be guaranteed. It was decided to wait for the results of the first intervention and then discuss about the other therapeutic options. It was agreed to perform a modified Thompson's quadricepsplasty by lengthening the right quadriceps with VY lengthening of vastus lateralis. Then fascia lata would be lengthened and 2 patellar fins would be released (figure 5, 6).

An incision was done medially until quadriceps was reached. We started with release of the lateral fins. Quadriceps was much retracted. The rectus femoris was isolated and it was disinserted at the patella level. The vastus medialis was cut at the lower middle-tier junction of the thigh. We made a Z lengthening of the fascia lata. Vastus medialis and lateralis were very tense preventing any bending of the knee. V-Y lengthening of the vastus lateralis was made for complete bending of the knee. The vastus intermedius with the rectus femoris were sutured together. Then the vastus lateralis was sutured with the common tendon of the vastus intermediary and rectus femoris. At the end

of the intervention we got a passive flexion that reached up to 100 degree. In extension the tendon was distended. Plan-by-plan closure was done. Skin was very tense. Knee was immobilised by a splint at 45-degree flexion while waiting for skin healing. Arthromotor kinetic was done for 0 to 45 degrees of flexion. Three weeks after the procedure skin condition

was good with active knee flexion between 0 and 50 degrees.

Two and a half months after the operation, sharp improvement was there with slightly adherent scar. Active extension was limited due to quadriceps weakness and knee was actively mobilized between 0 and 90 degree of flexion (figure7).



Fig-7: active mobilisation of the knee joint between 0 and 90 degree of flexion

Five months after the procedure, patella was well positioned in the trochlear groove with remodeling of the trochlea (figure 8).



Fig-8: x-ray showing good positionning of the patella in the trochlear groove

One and half years after the procedure, knee was stable in frontal plane with mobility from 0 to 100 degrees (figure 9).



Fig-9: X-ray of the knee after 1.5 years from the procedure

Quadriceps always slightly atrophied. Walking was normal with good tracking of the patella no episode of patellar dislocation.

DISCUSSION

Knee stiffness can occur due to retraction of quadriceps muscle. Adhesions between the deep surface of the patella and the femoral condyles, fibrosis and shortening of the lateral expansions of the vasti and their adherence to the femoral condyles, fibrosis of vastus intermedius, and shortening of rectus femoris are the components causing extension contracture resulting in limitation of flexion of knee as described by Judet [8] and Nicoll [12]. The outcome of management with respect to attainment of flexion of knee was better than the results previously reported which ranged from 9.5% to 100% [8, 11, 13, 14]. In the Thompson's technique of quadricepsplasty, vastus medialis, vastus lateralis and vastus intermedius are freed from rectus femoris through an anterior midline incision, so that rectus femoris is separated from rest of the quadriceps action [7]. In our case, V-Y lengthening of the vastus lateralis was made for complete bending of the knee. Usually vastus intermedius would be excised completely. In our case, vastus intermedius with the rectus femoris were sutured together. Then the vastus lateralis was sutured with the common tendon of the vastus intermedius and rectus femoris. Flexion of the knee would cause tension on the wound, and pressure from the patella and femoral condyles may cause ischemia of the skin [11]. In an attempt to reduce problems of wound healing in our case, the incision was made at the medial aspect of the thigh. The disrupted quadriceps muscle would compromise the extensor mechanism resulting in an extension lag. The extension lag after quadricepsplasty usually varies from 8° to 52° [7, 11]. The postoperative management after quadricepsplasty is very important to maintain flexion without loss of active extension. For four weeks postoperatively, vigorous passive exercises with an elastic bandage and strengthening exercises of the quadriceps are usually advised and continued less intensively for six months. In our case, knee was immobilised by a splint at 45-degree flexion while waiting for skin healing. Arthromotor kinetic for 0 to 45 degrees of flexion. This resulted in active knee flexion between 0 to 50 degrees at 3 weeks. The most common complications reported in previous studies are delayed wound healing, wound dehiscence, skin necrosis, infection, and limitation of extension [9, 11, 12]. There were no major complications in our case, except weakness in the quadriceps muscle limiting active extension.

CONCLUSIONS

Several modifications have been tried in the procedure of Thompson's quadricepsplasty. Here we have done Thompson's quadricepsplasty with VY lengthening of vastus lateralis and Z lengthening of fascia lata. This procedure was successful with no major complications and patient was able to walk normally with knee mobility from 0 to 100 degrees after one and half years after the procedure.

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