

Deep vein thrombosis and thromboprophylaxis in arthroscopic anterior cruciate ligament reconstruction

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ABSTRACT

Background: There is no clear evidence in the literature regarding the incidence of deep vein thrombosis (DVT) in patients undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction. Literature also lacks on the recommendations on thromboprophylaxis in patients undergoing elective arthroscopic ACL reconstruction. We conducted a prospective analysis to assess incidence of DVT in patients undergoing arthroscopic ACL reconstruction.

Materials and Methods: 120 consecutive patients with MRI proven ACL injury who were operated for arthroscopic ACL reconstruction were enrolled in this prospective study. None of the patients had risk factors (on history) for DVT, and all were below the age of 45 years. All cases were operated upon by a single surgeon and a standard rehabilitation regime was followed. The patients underwent clinical examination and screening (Doppler ultrasonography/venous scan) for any DVT, on the day prior to surgery, day of discharge (Day 3) and at 4 weeks postsurgery. None of the patients received any form of thromboprophylaxis against DVT.

Results: One hundred and twelve patients (61 males and 51 females) completed the study. The average age was 31.6 years (range 24-42 years). All patients underwent arthroscopic assisted ACL reconstruction surgery within 3 weeks of the injury. Two patients (males) in the series had Doppler venous scan proven DVT. One patient was asymptomatic but the screening Doppler picked up the DVT on the third postoperative day. The other patient was symptomatic at 12 weeks with pain and swelling in the leg and had ultrasound -proven DVT.

Conclusion: In our study the incidence of deep vein thrombosis in patients undergoing arthroscopic ACL reconstruction is 1.78%. We do not recommend routine thromboprophylaxis in patients, who are not high risk candidates for thrombosis and are of less than 45 years, in patients undergoing arthroscopic ACL reconstruction, with early postoperative rehabilitation.

Key words: Anterior cruciate ligament, deep vein thrombosis, reconstruction, arthroscopy, thromboprophylaxis

INTRODUCTION

Deep vein thrombosis (DVT) and its sequel is a concern following any lower limb surgery. With the rapid rise of arthroscopic surgeries and minimally invasive surgeries the rehabilitation has become faster for the patients but there has been incidence of deep vein thrombosis and its sequale.¹ The postthrombotic syndrome

shows a steady increase from 23% at 2 years to 49-100% at 5-10 years¹ and can ultimately result in amputation. Stringer *et al.*² were the first ones to report incidence of DVT following knee arthroscopic surgeries at 4.2%. Cullison *et al.*³ reported a single case of asymptomatic deep vein thrombosis out of 67 patients and recommended no prophylaxis in the absence of risk factors for patients under 40 years of age. Williams *et al.*⁴ with 3.5% incidence had similar recommendations. Other authors, Schipinger *et al.*⁵ with incidence of 8% and Demers *et al.*⁶ with 17.9% incidence, have made a strong plea for routine thromboprophylaxis following anterior cruciate ligament surgery. Ilahi *et al.*⁶ in their meta-analysis study have reported an overall incidence of 9.9% (3.1-17.9%). The meta-analysis study reported use of Doppler ultrasonography and contrast venography as screening tools; however that did not influence the total DVT rate. Schippinger *et al.*⁵ found 12% venous thrombo embolism (VTE) following knee arthroscopy in 101 patients and this was 5 weeks post surgery and patients had received Daltaperin (low molecular weight heparin). Holland *et al.*⁷ reported their observations on 101 patients undergoing

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knee arthroscopy and reported 1% symptomatic DVT during prophylaxis with nadroparin. In a retrospective trial, Passler *et al.*⁸ reported 4.7% DVT in 85 patients following ACL reconstruction despite thromboprophylaxis with standard low dose heparin.

With such varied incidence and ambiguity regarding prophylaxis protocol we conducted a prospective analysis to assess incidence of DVT in patients undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction and to identify the need, if any, for routine thromboprophylaxis in these patients.

MATERIALS AND METHODS

The institutional review board approval and informed consent from all the patients were obtained. Patients who reported to the emergency department, and were diagnosed to have torn ACL confirmed on MRI were included in this prospective study. The patients with concomitant ligamentous injuries (n=1), ipsilateral long bone injuries and patients requiring additional procedures on the same knee that may interfere with the rehabilitation, patients under 18 years of age (n=1), patients above the age 45 years, patients on antithrombotic or antiplatelet medications in the preoperative period, patients with past history of thrombosis or DVT, patients with clotting or bleeding disorders, BMI more than 30 (n=1), were excluded from this study. Patients under age 18 were excluded as we wait for the physical closure in order to do the transtibial procedure.

A total of 120 consecutive patients with MRI proven ACL injury were considered in this prospective study. All the patients underwent arthroscopic ACL reconstruction within 3 weeks following injury. While waiting for surgery; patients underwent a preoperative rehabilitation program which included the range of motion (ROM) exercises for the knee, the hamstrings and quadriceps strengthening exercises regularly. These patients were put on a ROM brace with lock in extension for ambulation purposes and weight bearing was allowed as tolerated. The patients were allowed full range of knee motion in the hinged brace. A detailed clinical history of the patient regarding the risk factors for thrombosis, previous history of DVT, drug intake, was documented.

On initial screening by the anesthesiologist none of the patients had risk factors for deep vein thrombosis, and all were below the age of 45 years. All cases were operated upon by a single surgeon and a standard rehabilitation regime was followed. The patients underwent clinical examination and screening (Doppler ultrasonography/

venous scan) for any DVT, on the day prior to surgery, day of discharge (day 3) and at 4 weeks postoperation. All the ultrasounds were done by a single radiologist who was blinded to the outcome of the study. Screening was done for both proximal and distal thrombosis. None of the patients received any form of thromboprophylaxis against DVT.

Operative procedure

The surgical procedure was standardized in all the patients and was conducted by the same surgeon (GK). All patients were operated under general laryngeal mask anesthesia. In all the patients an endoscopic arthroscopic procedure was done. One gram Cefuroxime sodium intravenously was administered. Tourniquet was applied and the quadrupled hamstring (Semitendinosus and Gracilis) autograft was used in all the cases. A Biotransfix system (Arthrex®, Florida, USA) was used for femoral fixation and Biointerference screw (Arthrex®, Florida, USA) was used on the tibial side. Single surgical technique and rehabilitation protocol was followed. No patient was given non steroidal antiinflammatory drugs for the first 2 weeks following surgery. For further technical details about the procedure the reader is referred to our earlier reported series.⁹ Postoperative analgesia was provided with intravenous tramadol for 24 h. The patient was mobilized and discharged on the first postoperative day.

Post operative rehabilitation

Postoperatively patient was placed in a hinged knee brace and touchdown weight bearing allowed for 2 weeks followed by weight bearing as tolerated. Immediate mobilization from 0°-90° was allowed for the first 2 weeks followed by progression to full ROM. A protective hinged knee brace was used for 6 weeks after surgery with motion limits of 0°-90° for first 2 weeks.

Progressive rehabilitation consisted of range of motion exercises, patellar mobilization, electrical stimulation (if needed), proprioception exercises, and closed chain strengthening exercises during the first 3 months postoperatively followed by straight line jogging, polymeric exercises, and sport specific exercises.

Patients were allowed to return to their pre injury sporting activities (sports played for leisure- cricket and soccer) at a minimum of six months after the reconstruction, using a custom made brace.

Clinical evaluation and screening for DVT

The clinical examination included local rise of temperature, redness and calf tenderness, increase in girth of the calf (>2 in.), pain in the calf on dorsiflexion (Homans test). Patients underwent a screening Doppler examination, on the day prior to surgery. Subsequent screening examinations

were done on third postoperative day and at 4 weeks. Clinical suspicion at any point in time during the follow up warranted Doppler examination. Patients were cautioned to report immediately in cases of excessive pain in calf, fever, swelling etc. None of the patients received any form of thromboprophylaxis against DVT. Patients diagnosed to have DVT (on Doppler) received therapeutic doses of low molecular weight heparin.

RESULTS

There were 120 patients who underwent ACL reconstruction from June 2006 to June 2008. Five patients were lost to follow up. Three patients were excluded as one patient was 17 years of age, one patient had BMI > 30 and one patient had posterolateral corner injury.

A total of 112 patients (61 males, 51 females) completed the study. None of these patients had any high risk for DVT. The right knee was involved in 62 cases whereas left in 50 cases. The mechanism of injury was fall (n=43), sports injury (n=41) and traffic accidents (n=28). The average age of the patients was 31.6 years (range 24-42 years). Duration since injury to surgery was 4-20 days. The mean operative time was 64.9 min (SD \pm 7.8). The average follow up was 28 months (26- 32 months). Patients were followed up at 1, 2, 4, 6, 12 weeks, 6 months, at 1 year and later at 6 monthly intervals.

Two patients (1.7%, *P* value > 0.05) in the series had Doppler venous scan proven DVT. One patient had no symptoms but the screening Doppler picked up the DVT at 1 week follow up. The other patient also had no symptoms and was picked up at 4 weeks following surgery. Incidentally both the patients did not have any underlying risk factors. In both the cases the clot was found in the posterior tibial veins. Both the patients were treated by Fondaparinux for 5 days followed by simultaneous warfarin sodium and PT/INR adjusted at 2-3 for a total period of 3 months. Scans repeated at 6 months showed that clot had resorbed and that there were no sequel.

DISCUSSION

With the advent of arthroscopic surgery the incisions have become smaller, the rehabilitation faster but there are reports of venous thrombosis following arthroscopic surgery. VTE is a common and clinically relevant complication of major orthopedic surgery. The most fatal complication of DVT is pulmonary embolism. Arthroscopically assisted surgeries like ACL reconstruction are more invasive than routine arthroscopic surgeries, take a relatively longer time and therefore should potentially be more predisposed to DVT.

Rosenberg *et al.*¹⁰ have reported that patients undergoing arthroscopically assisted surgery had a slightly higher incidence of venous thrombosis as compared to routine arthroscopic surgery, however, this difference was not statistically significant. The authors further recommended that it is not advisable to routinely use duplex ultrasound pre and postoperatively; it is more prudent to spend the resources on patient education and having a high degree of suspicion in high risk cases.

There is no accepted norm regarding the thromboprophylaxis in patients undergoing arthroscopic assisted ACL reconstruction. Geerts¹¹ *et al.* reviewed the literature and recommended against routine prophylaxis following knee arthroscopy and were in favor of earlier mobilization. For patients with underlying risk factors (as defined by Sanz *et al.*¹²) or following a prolonged or complicated surgery routine prophylaxis with low molecular weight heparin was recommended by Geerts *et al.*¹¹ However, this was not specific for ACL reconstructions. Cullison *et al.*³ in their prospective study reported a 15% incidence of DVT following ACL reconstruction and none of the patients had received thromboprophylaxis. In the first randomized trial studying the efficacy of dalteparin following arthroscopic knee surgery, Michot *et al.*¹³ reported that DVT rate dropped to 1.5% versus 15.5% in the controls when prophylaxis was given for 30 days. Wirth *et al.*¹⁴ in their prospective study reported a significant reduction in incidence of thrombosis -4.1% in controls who had not received Reviparin (low molecular weight heparin) versus 0.85% in the case who had received the drug. The authors recommended 10 days of prophylaxis. Keller *et al.*¹⁵ showed the superior outcome following 10 days of prophylaxis as compared to 5 days in patients undergoing routine arthroscopy. Irani *et al.*¹⁶ recommended 4-6 week prophylaxis with LMWH following routine arthroscopy. As can be seen from the above studies there is no consensus as to duration of therapy following routine arthroscopic surgery.

There are no prospective studies comparing the incidence of DVT, with and without the use of thromboprophylaxis following ACL reconstruction. There has been only one study by Curison *et al.*³ which commented upon incidence of DVT following arthroscopic assisted ACL reconstruction surgery. To the best of our knowledge this is the only study in literature which has focused on incidence of DVT following ACL reconstruction in a prospective fashion. In one of the earlier studies published⁹ authors compared the outcome of early versus delayed surgery, in which a single dose of Fondaparinux (LMWH) was used in the post operative period and no patient had any evidence of DVT. These studies were performed at the same institution at two different points in time. In the published study which was

performed earlier, all patients received thromboprophylaxis. As there was no incidence of DVT in our study, the practice was changed and thromboprophylaxis was used in patients who are at high risk for development of DVT. In the current study no thromboprophylaxis was chosen to be given in the selected low risk group and we evaluated the incidence of the DVT in that group. A randomized controlled study comparing the thromboprophylaxis and no thromboprophylaxis is the area of future research. The cost-effectiveness of thromboprophylaxis, for arthroscopic knee surgery merits further studies.

In the present study, two patients (1.7%) ($P > 0.05$) had Doppler venous scan proven DVT. Both the patients were asymptomatic and were picked up at routine screening at 1 and 4 weeks respectively. None had pulmonary embolism. The low incidence is comparable to other studies by Michot *et al.* and Wirth *et al.* However, in these studies thromboprophylaxis was used and none of the patients had ACL reconstruction. We attribute the low incidence of DVT in our series to the early mobilization following surgery which theoretically reduces venous stasis and decreases the risk for DVT. In our study model, the inclusion criteria was strict enough to include only isolated ACL injuries and patients without risk factors for the DVT. The accelerated rehabilitation protocol also helps in reducing the incidence of DVT.

The strength of our study is good number of patients, prospective documentation of the data, strict inclusion criteria, and followup of the patients. The exclusion of cases with associated injuries, patients with risk for DVT, head injury, and obese patients were the limitation of our study. Also the protocol decided for screening ultrasonography was decided based on peak incidence of DVT. This stems from the fact that there are no prescribed norms available in literature for ultrasound screening following arthroscopic surgery. Further this is not a comparative study with and without thromboprophylaxis. However, if we look at a study published earlier⁹ and compare it with the present study, one can see that despite not receiving thromboprophylaxis there is not much difference in the incidence of DVT. Prospective randomized clinical trials with and without thromboprophylaxis for arthroscopic assisted ACL reconstruction are required to assess the risk benefit of the use of DVT prophylaxis in these subset of patients.

To conclude the incidence of DVT in patients undergoing arthroscopic ACL reconstruction is 1.78%. We do not recommend routine thromboprophylaxis in patients, who are not high risk candidates for thrombosis and are of less than 45 years, when an early postoperative rehabilitation is followed, in patients undergoing arthroscopic ACL reconstruction.

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