

Original Research Article

Vancomycin in anterior cruciate ligament graft preparation; does it really reduce infection rate?

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Received: 11 November 2024

Revised: 18 December 2024

Accepted: 23 December 2024

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ABSTRACT

Background: The aim of our study is to evaluate how the incidence of septic arthritis or postoperative infection is affected by the use of vancomycin in preparation of grafts during anterior cruciate ligament (ACL) reconstruction.

Methods: This is a retrospective comparative study conducted between two groups, first group operated in the period from August 2017 to August 2018, second group operated in the period from December 2022 to December 2023. It focuses on the incidence of post-operative infection rate in ACL reconstruction surgeries. All patients who had ACL reconstruction were included, all surgeries were performed by a single surgeon at the same hospital with the same set up and consumables. Infection was defined as a return to the operating room for irrigation and debridement within 90 days after surgery.

Results: Total of 130 patients were included in the study, first group (vancomycin group) or second group (non-vancomycin group) no patients suffered from postoperative deep infection, neither on the immediate post operative follow up, nor at the end of their final follow up. Comparing the two groups, more revision anterior cruciate reconstructions included in the second group, yet no single case of infection took place in any of the two groups.

Conclusions: In conclusion we found no difference between adding vancomycin to the graft or not adding it, as both groups showed no infection.

Keywords: Vancomycin, ACL, Arthroscopy

INTRODUCTION

Anterior cruciate ligament (ACL) injuries, which account for approximately 60% of all knee injuries in pivoting sports, plague millions of sports participants.^{1,2}

The ACL does not heal on its own when torn, and surgical reconstruction is the standard treatment.^{3,4}

Although several surgical techniques for ACL reconstruction have been developed to be less invasive and more effective for patients, the optimal ACL reconstruction technique is still a highly demanding clinical issue in orthopaedic research.⁵

Knee septic arthritis after ACL reconstruction is an uncommon but devastating complication.^{6,7}

Even with the best available treatment, it increases risk of long-term joint dysfunction due to graft failure and articular cartilage damage compared with an uneventful ACL reconstruction.⁸⁻¹¹

It has been theorized that a primary source of postoperative ACL reconstruction infection is graft contamination with skin commensal bacteria in both autograft and allograft scenarios.¹²

The standard of care for preventing infection in orthopedic surgery is use of IV prophylactic antibiotics.¹³

A recent systematic review found a 2-fold infection rate in patients not receiving IV antibiotics before knee arthroscopy.¹⁴

Vertullo et al showed initial success in decreasing the infection rate after ACL reconstruction using hamstring autografts. In 2019, Naendrup et al published a systematic review and meta-analysis on the early reports of this technique, including some unpublished material. After which a considerable number of researches have been conducted in the same matter.^{15,16}

Therefore, the purpose of this study was to compare the incidence of postoperative infection in ACL reconstruction with or without vancomycin treated grafts.

Rationale

Vancomycin presoak-age of ACL grafts is a well-known practice, but we noticed that the infection rate was the same even in patients who vancomycin was not used in their surgeries in our centre, so a structured report was conducted to prove that.

METHODS

Study design

This is a single-center, single surgeon, level III retrospective comparative study.

Setting

The operations were performed in Khoula hospital which is a tertiary public health service referral centre, the hospital electronic medical records (EMR) system was reviewed, and data collected for the period from July/2017 to December/2023, with the follow up record until November/2024.

Participants

All patients who had arthroscopic cruciate ligaments reconstruction were included.

Total number of patients who meet the inclusion\exclusion criteria was 130 patients, which were divided into two groups, group 1 comprised of 64 patients who received IV antibiotics and graft pre-soaking in a vancomycin solution of 5 mg/ml.

Group 2 comprised of 66 patients who received pre-operative IV antibiotics without topical graft pre-soaking. Group review of the postoperative follow-up and incidence of infection was recorded.

Data collected was age, gender, affected side, postoperative out-patient follow-up notes, readmission notes.

Inclusion criteria

All patients who had ACLs injury and underwent arthroscopic reconstruction while using hamstring tendons as autograft or allograft were included.

Exclusion criteria

Patients with preoperative skin problems, current systemic\localized infection. Acute ACL reconstructions were not performed at our set up during the period of this report were excluded.

Statistical methods

Descriptive statistics in terms of using the incidence of the parameter of concern, which is infection as defined.

Ethics, funding, and potential conflicts of interest

Authors state that there is no conflict of interest. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article. No funds were received in support of this study.

RESULTS

The 130 patients were identified using our inclusion criteria.

Group 1

The 64 patients all were males with their ages ranging between 17 and 43 years old (Figure 1). With 36 right knee affection (56.2 %) and 28 left knees affection (43.8%) (Figure 2).

The 61 patients underwent primary ACL reconstruction (95.4%) and 3 patients underwent revision ACL reconstruction (4.6%) (Figure 3).

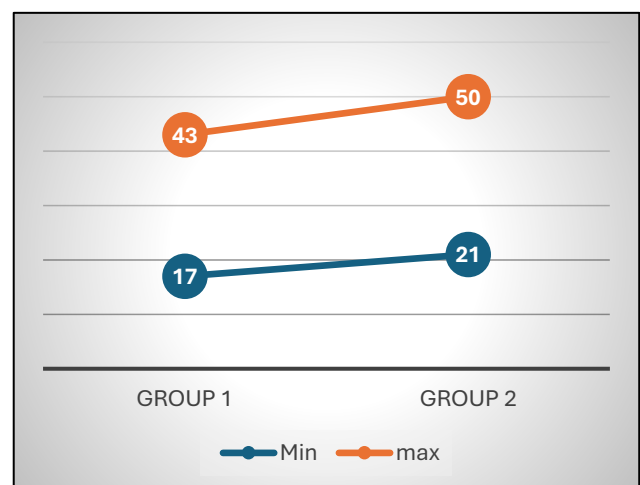


Figure 1: Age chart.

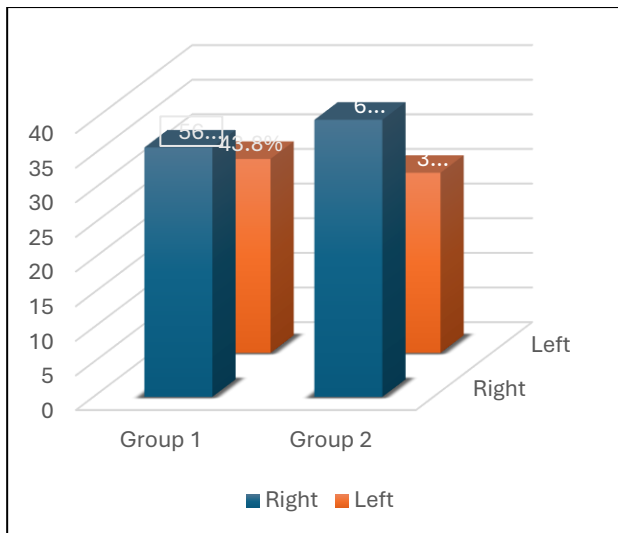


Figure 2: Side affection.

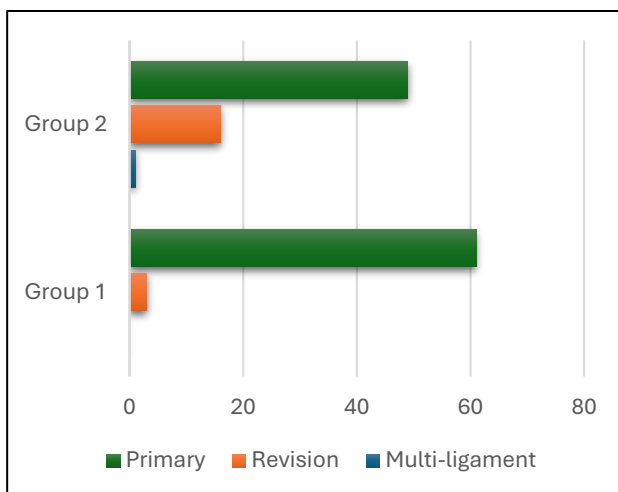


Figure 3: Complexity of surgery.

Group 2

66 patients all were males with their ages ranging between 21 and 50 years old (Figure 1). With 40 right knee affection (60.6%) and 26 left knees affection (39.4%) (Figure 2).

49 patients underwent primary ACL reconstruction (74.2%), 16 patients underwent revision ACL reconstruction (24.3%) and one case underwent ACL \ PCL reconstruction (1.5%) (Figure 3).

Thorough review of the subject's electronic files and post operative follow-up was conducted.

Minimum post-operative follow-up was 11 months.

Infection was defined as a return to the operating room for irrigation and debridement within 90 days after ACL reconstruction.

It was found that no patient in both groups had to be taken back for washout due to infection.

DISCUSSION

ACL reconstruction using hamstring tendon graft is a common operation that is in high demand and has a proven outcome in addressing knee instability due to ACL deficiency.¹⁷

In regard to hamstring tendons harvest effect on hip extension it was shown by Hadi et al that graft type had no effect on hip extension strength following ACL reconstruction, and the harvest of one or both hamstrings had no deleterious effect on hip extension force.¹⁸

Dong et al stated that using hamstrings tendons as a single bundle reconstruction, is well accepted technique and no difference between it and the double stranded technique was noticed.¹⁹

This operation can be done early or late, and the debate is still on as to how early the ACL deficient knee could safely be operated.

In our study all ACLR were performed using the hamstrings tendons allograft as a single bundle, while using the same manufacturer Tight rope on the femoral side and interference screw on the tibial side for fixation. All the cases had been performed on elective basis, with no single acute operation, in a major busy centre, with very high vigilance to post operative wound care being practiced for all patients.

In both groups we started with graft harvest, and while an experienced surgical assistant is preparing the graft, the primary surgeon is preparing the joint arthroscopically, hence usually by the time the graft is prepared, there is no delay until implantation.

As for the issue of using prophylactic vancomycin during graft preparation, this report is presenting a single surgeon's series of cases with the first group with, and the second group without the usage of vancomycin in graft preparation.

After cleaning and preparation, the surgical site for the graft harvest, arthroscopic portal sites and the joint is injected with a total of 20 ml infiltration (consisting of 15 ml saline, 4 ml 2% xylocaine, 1 ampule of (1:1000 units) adrenaline).

Those grafts which were treated with vancomycin, we used one gram of vancomycin which was diluted with sterile water to make a 10 ml of diluted vancomycin, 5 ml of which was used to soak the graft itself and then soak a sterile gauze that is then rapped around the prepared graft, while the other 5 ml were injected at the harvest site and inside the knee joint.

Septic arthritis after ACL reconstruction is uncommon and has been documented in 0.1% to 1.8% of various retrospective investigations.²⁰⁻²³

Kanj et al and colleagues in their study have recommended the use of local vancomycin, when possible, in clean orthopedic surgery as they reported a reduction in post-operative infection.²⁴

And in a more specific studies, Banios et al have shown that soaking ACL autografts in a 5 mg/ml vancomycin solution can greatly minimize (or perhaps completely eradicate) septic arthritis after ACL reconstruction.²⁵

The use of vancomycin-soaked grafts was associated with a ten-fold reduction in postoperative infection after ACL reconstruction. But they have also reported other risk factors for postoperative infection after ACL reconstruction including increased BMI and increased operative time.²⁶

Numerous factors have been investigated to see if they increase the risk of infection following ACL reconstruction. A multivariate logistic regression was used to predict infection risk factors in a sample of 1,397 patients who had ACL reconstruction in a recent meta-analysis conducted by Murphy et al. Age over 20, male sex, connective tissue illness, use of immune-suppressive drugs, and HT graft were all significant factors.²⁷

In a multivariate analysis of 6,389 ACL repair patients, Westermann et al compared the infection rates of hospitalized and outpatient patients. The prevalence of infection among admitted patients has significantly increased, according to the authors, who came to the conclusion that outpatient treatment can be improved.²⁸

Graft contamination is a risk for the development of septic arthritis.^{29,30} Accidental contamination of the graft is a modifiable risk factor and is important to consider in graft contamination prevention. If this happens, there are protocols for treating the contaminated graft, which include the use of gentamicin and chlorhexidine, obtaining negative cultures of >90%.³¹

The question is why if a surgeon is having no infection, while using vancomycin in graft preparation, would stop using vancomycin, for this there were two reasons for, firstly the literature was not so conclusive then in-favor of the vancomycin usage, secondly vancomycin was seen physically too aggressive to the graft, as the hamstrings tendons with vancomycin felt way less slippery to the grip while using surgical gloves additionally at the same time other colleagues at the same institution didn't use vancomycin hence, we also stopped using vancomycin for graft preparation.

The review of these two groups shows no difference as for using or not using vancomycin in regard to infection.

Further studies may have to address as the link between infection and the time the hamstrings tendons allograft was outside the patient's body after harvesting, during preparation and until implantation, as there could be an implantation delay factor that could lead to increased chance of infection.

Limitation in this study include being retrospective study, relatively small sample number, a larger sample size with variations in gender, age and setting is needed.

CONCLUSION

Despite the obvious difference in results in other studies favouring vancomycin use, our study yielded a no significant difference result, which raises the question of do we really need to use vancomycin or just adhere to the infection control protocols.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Osman SM, Al Lawati AAM. Vancomycin in anterior cruciate ligament graft preparation; does it really reduce infection rate? *Int J Res Orthop* 2025;11:259-63.