

Is Pre-operative Screening of Cultures of Urine and Nasal Swab is Useful in Patients Undergoing Total Knee Arthroplasty?

Mahendra Kumar Gupta¹, P Dhanasekararaja², S Rajasekaran³

¹Department of Orthopaedics, Ganga Hospital, Coimbatore, Tamil Nadu, India, ²Senior Consultant, Department of Orthopaedics, Ganga Hospital, Coimbatore, Tamil Nadu, India, ³Director, Department of Orthopaedics, Ganga Hospital, Coimbatore, Tamil Nadu, India

Abstract

Background: Infection is a major complication after total joint arthroplasty. The urinary and nasal tract is a possible source of surgical site contamination but the role of asymptomatic bacteriuria before elective surgery and subsequent risk of infection is poorly understood.

Aim: This study aims to identify a correlation between pre-operative screening of urine and nasal culture/sensitivity and prosthetic joint infections postoperatively in patients undergoing total knee arthroplasty (TKA).

Methods: Patients undergoing TKA from July 2015 to March 2016 were reviewed in our center for a period of 6 months. In all cases, a urine sample and a nasal sample were cultured. Symptomatic urinary tract infection and patients with significant growth (>1 lac colony counts/ml) were treated with sensitive antibiotics for 7 days. Patients with asymptomatic bacteriuria or colony counts <1 lac/ml were not treated with any antibiotics. Patients were followed up for 6 months.

Results: A total of 624 patients were enrolled in the study. In 35 (0.056%) patients, urine routine was positive for pus cells (>=10 pus cells/hpf) and out of them 25 (0.04%) patients were positive for urine culture. The study was undertaken over 6 month period, and only 2 patients (0.003%) developed a wound site infection, however, these case were negative for pus cells in urine routine as well as urine culture examination. None of the patients had a positive growth in their nasal cultures. All urine cultures returned Gram-negative infections with the exception of one being a fungal infection.

Conclusion: The role of pre-operative nasal swab and urine cultures and the presence of asymptomatic bacteriuria are independent of the causation of prosthetic joint infections and are not warranted in our population.

Key words: Bacteriuria, Total knee arthroplasty, Urine culture

INTRODUCTION

Infection is one of the most serious complications after total knee arthroplasty (TKA). Revision of TKA because of infection is associated with long hospitalization, many operations, and with a current mortality rate of 1–2.7%.^[1-5] Although its reported incidence now is <1%, its treatment is among the most expensive of orthopedic procedures. The importance of prevention is critical because of the devastating clinical and economic consequences.

Urinary tract infection (UTI) is a common nosocomial infection creating potential bacteremia.^[6,7] The presence of a urinary catheter is the main risk factor for UTI^[8-10] and can precipitate bacteremia.^[11-15] In orthopedic surgery, UTI as a source for joint infection is the subject of controversy.^[16] Some authors suggest that UTI should be treated before the joint arthroplasty^[6] whereas others have stated that there are no well-documented data to support the association between UTI and joint infection.^[17,18] Some authors report an association between post-operative bladder catheterization and subsequent joint infection.^[12,15,16] However, these data are from case reports or case series^[12,15,16] and their validity is questionable.^[7]

We, therefore, asked whether a treated pre-operative UTI or asymptomatic bacteriuria increases the risk of joint

Access this article online



www.ijss-sn.com

Month of Submission : 01-2021
Month of Peer Review : 01-2021
Month of Acceptance : 02-2021
Month of Publishing : 03-1021

Corresponding Author: Dr. Mahendra Kumar Gupta, Department of Orthopaedics, Ganga Hospital, Coimbatore, Tamil Nadu, India.

infection and whether the organisms are the same when UTI and joint infection occur in the same patient.

The urinary and nasal tract is a possible source of surgical site contamination but the role of asymptomatic bacteriuria before elective surgery and subsequent risk of infection is poorly understood. Whether patients with asymptomatic bacteriuria in nasal swab and urine should be investigated and treated before elective total knee replacement (TKR) remains controversial.

Many orthopedic surgeons do not routinely test urine and nasal swab. The American Academy of Orthopaedic Surgeons recommends urine analysis only for patients with a history of frequent urinary infections,^[17] but other organizations^[18] and authors^[19-28] avoid definitive guidance. A postal survey in the United Kingdom reported that two-thirds of orthopedic surgeons would treat asymptomatic bacteriuria before TKR, but 70% had no evidence to cite as a reason for this practice.^[8]

Our present study is to identify a correlation between pre-operative screening of urine and nasal swab culture and sensitivity and prosthetic joint infections postoperatively in patients undergoing TKA.

Aims and Objectives

This study aims to identify a correlation between pre-operative screening of urine and nasal swab culture and sensitivity and prosthetic joint infections postoperatively in patients undergoing TKA.

MATERIALS AND METHODOLOGY

Ethics committee approval was taken from the Institutional Review Board (IRB), Ganga Hospital and Research Pvt. Ltd., Coimbatore, Tamil Nadu, India.

In this study, we did urine routine examination, urine culture, and nasal swab culture in every patient, undergoing TKA. In patients with significantly positive culture (>1 lac colony counts/ml), 1 week antibiotic treatment was given according to the culture and sensitivity. Patients underwent TKA with regional anesthesia and pre-operative antibiotics, inj. ceftriaxone 1.5 g and inj. amikacin 1 g i.v., were given followed by two doses of inj. ceftriaxone 1.5 g postoperatively. Plain bone cement (without antibiotic) was used. Most patients had only a subcutaneous drain. Aspirin and mechanical devices were used for DVT prophylaxis.

Patients with post-operative urinary retention were catheterized by Foley's catheter which was removed after ambulation. Patients with symptomatic UTI were started on empirical antibiotic and switched on other antibiotic

according to culture and sensitivity. All these patients were followed for a period of 6 months.

Design of the Study

This was an observational study.

Data Collection

Prospective.

Sample Size and Study Duration

Patients undergoing TKA from July 2015 to March 2016 were reviewed in our center for a period of 6 months in Ganga Hospital, Coimbatore, Tamil Nadu.

In all cases, a urine sample and a nasal sample were cultured. Symptomatic UTI and patients with significant growth (>1 lac colony counts/ml) were treated with sensitive antibiotics for 7 days. Patients with asymptomatic bacteriuria or colony counts <1 lac/ml were not treated with any antibiotics.

Patients were followed up for 6 months postoperatively asking for details of signs and symptoms of prosthetic joint infection, any eventual pathogens, and any related treatment with antibiotics.

RESULTS

A total of 624 patients (male 205 [32%] and female 419 [62%]) were studied, who undergone TKR in Ganga Hospital for a period of 6 months between July 2015 and March 2016.

The mean age of the patients was 69.1 years and, all were followed up postoperatively 6 months for potential prosthetic joint infection of urinary or nasal or both origins. One hundred and thirty-one patients (20%) were diabetic.

Out of 624 TKR patients, 224 (35%) patients required post-operative catheterization which remained *in situ* for more than 12 h.

In 35 (0.056%) patients, urine routine was positive for pus cells (≥ 10 pus cells/hpf) and out of them 25 (0.04%) patients were positive for urine culture.

Organism was found in urine culture in the following numbers of patients:

- *E. coli* – 21
- *Klebsiella* – 2
- *Proteus* – 1
- *Candida* – 1.

Fifty-seven (0.09%) number of patients were treated by antibiotics for an average of 1 week.

However, nasal swab culture was negative in all patients.

There were only 2 (0.003%) cases who developed wound site infection after 6-week follow-up, out of them one patient becomes negative for wound infection after 3-month follow-up.

However, the cases developed wound site infection was negative for pus cells in urine routine as well as urine culture.

DISCUSSION

These results support the hypothesis that the pre-operative urine and nasal swab culture before elective joint replacement surgery are not mandatory and add to unnecessary cost. The study was undertaken over a 6-month period, and only 2 patients (0.003%) developed wound site infection, however, these cases were negative for pus cells in urine routine as well as urine culture examination.

Fortunately, in daily practice, chronic bacteriuria almost never provokes UTI. Thus, not even patients who undergo renal transplantation require the eradication of asymptomatic urinary colonization preoperatively.^[18] Infection of a joint replacement presumably requires the urinary infection to become bacteremia, which is a relatively rare event even in neglected lower UTIs. Theoretically, the very rare occurrence of urinary incontinence might secondarily infect a freshly implanted TKR due to direct contamination of the wound.^[23]

Review of relevant orthopedic literature supports our findings. Koulouvaris *et al.*,^[12] in a retrospective study involving 20,000 patients, found no association between the pre-operative UTI (odds ratio, 0.341; 95% confidence interval, 0.086–1.357) and post-operative UTI (odds ratio, 4.222; 95% confidence interval, 0.457–38.9) and wound infection which is also supported by other reports.^[10,25]

A retrospective analysis by Uçkay *et al.* between 1996 and 2008 revealed 71 infected replacements and none could be attributed to a urinary infection.^[27]

A recent study of 471 patients randomized to receive or not to receive systemic antibiotics for 7 days, based on a cutoff of 105 colonies/ml in pre-operative urine cultures, found no infected THRs of urinary origin and concluded that 25,000 asymptomatic bacteriuria would need to be treated to prevent one joint replacement infection.^[5]

CONCLUSION

The pre or post-operative assessment of the urine in asymptomatic patients who undergo joint replacement generates modest but unnecessary cost and may lead to inappropriate use of antibiotics. If symptomatic infection occurs, there is sufficient time for targeted antibiotic treatment to prevent urinary sepsis and hematogenous spread to a joint replacement.

The role of pre-operative nasal swab^[16] and urine cultures and the presence of asymptomatic or symptomatic bacteriuria are independent of the causation of prosthetic joint infections and are not warranted in our population.

REFERENCES

- Burke JP. Infection control: A problem for patient safety. *N Engl J Med* 2003;348:651-6.
- Crockarell JR, Hanssen AD, Osmon DR, Morrey BF. Treatment of infection with debridement and retention of the components following hip arthroplasty. *J Bone Joint Surg Am* 1998;80:1306-13.
- Cruess RL, Bickel WS, vonKessler KL. Infections in total hips secondary to a primary source elsewhere. *Clin Orthop Relat Res* 1975;106:99-101.
- Clement S, Young J, Munday E. Comparison of a urine chemistry analyser and microscopy, culture and sensitivity results to detect the presence of urinary tract infections in an elective orthopaedic population. *Contemp Nurse* 2004;17:89-94.
- Cordero-Ampuero J, González-Fernández E, Martínez-Vélez D, Esteban J. Are antibiotics necessary in hip arthroplasty with asymptomatic bacteriuria? Seeding risk with/without treatment. *Clin Orthop Relat Res* 2013;471:3822-9.
- David TS, Vrahas MS. Perioperative lower urinary tract infections and deep sepsis in patients undergoing total joint arthroplasty. *J Am Acad Orthop Surg* 2000;8:66-74.
- Deacon JM, Pagliaro AJ, Zelicof SB, Horowitz HW. Prophylactic use of antibiotics for procedures after total joint replacement. *J Bone Joint Surg Am* 1996;78:1755-70.
- Finnigan TK, Bhutta MA, Shepard GJ. Asymptomatic bacteriuria prior to arthroplasty: How do you treat yours? *J Bone Joint Surg Br* 2012;94-B:58.
- Glynn MK, Sheehan JM. The significance of asymptomatic bacteriuria in patients undergoing hip/knee arthroplasty. *Clin Orthop Relat Res* 1984;185:151-4.
- Hanssen AD, Osmon DR, Nelson C. Prevention of deep periprosthetic joint infection. *J Bone Joint Surg Am* 1996;78:458-71.
- Koulouvaris P, Sculco P, Finerty E, Sculco T, Sharrock NE. Relationship between perioperative urinary tract infection and deep infection after joint arthroplasty. *Clin Orthop Relat Res* 2009;467:1859-67.
- Lentino JR. Prosthetic joint infections: bane of orthopedists, challenge for infectious disease specialists. *Clin Infect Dis* 2003;36:1157-61.
- Maderazo EG, Judson S, Pasternak H. Late infections of total joint prostheses: A review and recommendations for prevention. *Clin Orthop Relat Res* 1988;229:131-42.
- Minnema B, Vearncombe M, Augustin A, Gollish J, Simor AE. Risk factors for surgical-site infection following primary total knee arthroplasty. *Infect Control Hosp Epidemiol* 2004;25:477-80.
- American Academy of Orthopaedic Surgeons, OrthoInfo; 2013. Available from: <http://www.orthoinfo.aaos.org/topic.cfm?topic=a00389>. [Last accessed on 2013 Dec 17].
- Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM, *et al.* Infectious diseases society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. *Clin Infect Dis* 2005;40:643-54.
- Olson ES, Cookson BD. Do antimicrobials have a role in preventing

- septicaemia following instrumentation of the urinary tract? *J Hosp Infect* 2000;45:85-97.
18. Peersman G, Laskin R, Davis J, Peterson M. Infection in total knee replacement: A retrospective review of 6489 total knee replacements. *Clin Orthop Relat Res* 2001;392:15-23.
 19. Ritter MA, Fechtman RW. Urinary tract sequelae: Possible influence on joint infections following total joint replacement. *Orthopedics* 1987;10:467-69.
 20. Rajamanickam A, Noor S, Usmani A. Should an asymptomatic patient with an abnormal urinalysis (bacteriuria or pyuria) be treated with antibiotics prior to major joint replacement surgery? *Cleve Clin J Med* 2007;74:S17-8.
 21. Sharrock NE, Finerty E. Hip replacement, hip seeding, and epidural anaesthesia. *Lancet* 2005;365:1011-2.
 22. Stamm WE. Catheter-associated urinary tract infections: Epidemiology, pathogenesis, and prevention. *Am J Med* 1991;91:65S-71S.
 23. Stephan F, Sax H, Wachsmuth M, Hoffmeyer P, Clergue F, Pittet D. Reduction of urinary tract infection and antibiotic use after surgery: A controlled, prospective, before-after intervention study. *Clin Infect Dis* 2006;42:1544-51.
 24. Saleh K, Olson M, Resig S, Bershasky B, Kuskowski M, Gioe T, *et al.* Predictors of wound infection in hip and knee joint replacement: Results from a 20 year surveillance program. *J Orthop Res* 2002;20:506-15.
 25. Ure KJ, Amstutz HC, Nasser S, Schmalzried TP. Direct-exchange arthroplasty for the treatment of infection after total hip replacement: An average ten-year follow-up. *J Bone Joint Surg Am* 1998;80:961-8.
 26. Uçkay I, Lübbeke A, Emonet S, Tovmirzaeva L, Stern R, Ferry T, *et al.* Low incidence of haematogenous seeding to total hip and knee prostheses in patients with remote infections. *J Infect* 2009;59:337-45.
 27. Warren JW. The catheter and urinary tract infection. *Med Clin North Am* 1991;75:481-93.

How to cite this article: Gupta MK, Dhanasekararaja P, Rajasekaran S. Is Pre-operative Screening of Cultures of Urine and Nasal Swab is Useful in Patients Undergoing Total Knee Arthroplasty? *Int J Sci Stud* 2021;8(12):73-76.

Source of Support: Nil, **Conflicts of Interest:** None declared.