

Role of Topical Vancomycin in Hip Arthroplasty: A Retrospective Study

Anshul Dahuja¹, Kapil Bansal^{2*}, Rashmeet Kaur³, Jagdeep Singh², Radhey Shyam⁴, Nikhil Gupta⁵

¹Assistant Professor, ²Associate Professor, ⁴Professor and Head, ⁵Junior Resident,
Department of Orthopaedics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.

³Assistant Professor,
Department of Radiodiagnosis, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.

ABSTRACT

Background: Total hip arthroplasty has progressed to become one of the most successful surgical procedures, but infection remains a serious complication. Surgical site infections (SSI) continue to be a significant source of morbidity despite the introduction of perioperative intravenous antibiotics. The objective of the study was to assess the efficacy of local vancomycin powder on lowering deep SSI rates in hip arthroplasty without any systemic or adverse clinical effects.

Materials and Methods: The present retrospective study was carried out between March 2015 to December 2020 with 141 cases of hip arthroplasty. Sixty patients received 1gram vancomycin powder directly into the surgical wound during surgery, and the remaining 81 patients served as controls. Demographic data, patient comorbidities, injury and treatment details, and infection details will be recorded. The recorded data was compiled, and Descriptive and comparative statistics was performed.

Results: A total of 141 patients were included in the study. Sixty patients received 1gram vancomycin powder directly into the surgical wound during surgery, and the remaining 81 patients served as controls. The post-operative wound infection in 13 of the 141 patients (9.21%). It was found that 9 of the

patients who developed post-operative wound infection were in the non-vancomycin-treated group and 4 were in the vancomycin-treated group. The rate of the infection was found to be 6.66% in the vancomycin-treated and 11.11% in the non-vancomycin treated group.

Conclusion: The present study concluded that the rate of the infection was found to be 6.66% in the vancomycin-treated and 11.11% in the non-vancomycin treated group.

Keywords: Vancomycin, Surgical Wound, Hip Arthroplasty.

*Correspondence to:

Dr. Kapil Bansal,
Associate Professor,
Department of Orthopaedics,
GGSMCH, Faridkot, Punjab, India.

Article History:

Received: 08-02-2021, Revised: 05-03-2021, Accepted: 27-03-2021

Access this article online	
Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2021.7.2.010	

INTRODUCTION

Total hip arthroplasty (THA) is a highly successful approach for the treatment of hip osteoarthritis, with a 92% to 94% survivorship at 7 to 12 year follow up.⁹ Despite the overall success of THA, periprosthetic joint infection (PJI)-the most common cause of readmissions after total joint arthroplasty-occurs in approximately 1% to 2% of patients.^{1,2}

In spite of advances in surgical techniques and operative room environment, approximately 1% patients develop infection after hip replacement. Despite systemic use of antibiotic prophylaxis, post-surgery infection remains a cause of concern in joint replacement surgery.³

Infection has marked impact on patients and their resources as they had to undergo repeated surgical procedures, delayed rehabilitation and poor surgical outcome.⁴ Local application of antibiotic results in high concentration at the operative site and systemic effects are thus avoided.⁵⁻⁷ Staphylococcus is one of the

commonest organism causing surgical site infection and application of vancomycin locally can reduce its incidence.^{8,9} The mechanism of action underlying this effect is believed to be direct local bactericidal action at the site of wound inoculation during surgery. This hypothesis is supported by the fact that skin flora account for the predominant pathogens. There are no reported serious complications with the use of vancomycin locally.¹⁰ Local administration of topical powdered antibiotics was first popularized in the late 1960s for prevention of wound infection in abdominal surgery prior to the existence of effective systemic prophylaxis.¹¹ Topical antibiotics have also been applied locally in irrigation solutions, ointments, pastes, beads, sponges, and fleeces.⁶ Local administration of powdered antibiotics is an attractive method, as it has the potential to deliver exceptionally high doses of antibiotic to the surgical site with less systemic exposure and thus potentially fewer adverse systemic effects.¹²

MATERIALS AND METHODS

The present retrospective study was carried out between March 2015 to December 2020 with 141 cases of hip arthroplasty. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written consent was taken from the patient after explaining the study. Sixty patients received 1 gram vancomycin powder directly into the surgical

wound during surgery, and the remaining 81 patients served as controls. Demographic data, patient comorbidities, injury and treatment details, and infection details will be recorded from CR office. The recorded data was compiled, and Descriptive and comparative statistics was performed. The values of all parameters were presented as the mean standard deviation. Fischer exact test and t-test considered significant for $p < 0.05$.

Table 1: Distribution of patients

Groups	No. of patients
Vancomycin group	60
Control group	81
Total patients	141

Table 2: Comparative of surgical site infection (SSI) between groups

	SSI Absent	SSI present	Total	p value
Vancomycin group	56(93.33%)	4(6.66%)	60(42.55%)	< 0.05
Control group	72(88.88%)	9(11.11%)	81(57.44%)	
Total patients	128(90.78%)	13(9.21%)	141(100%)	

RESULTS

A total of 141 patients were included in the study. Sixty patients received 1gram vancomycin powder directly into the surgical wound during surgery, and the remaining 81 patients served as controls. The post-operative wound infection in 13 of the 141 patients (9.21%). It was found that 9 of the patients who developed post-operative wound infection were in the non-vancomycin-treated group and 4 were in the vancomycin-treated group. The rate of the infection was found to be 6.66% in the vancomycin-treated and 11.11% in the non-vancomycin treated group.

DISCUSSION

The use of topical vancomycin was first reported in 1989 when the application of topical vancomycin to the sternum in cardiothoracic patients reduced rates of sternal infection from 3.6% to 0.45%.¹³ The first large retrospective study investigating the clinical efficacy of VP was published in 2011 and reviewed 1,732 consecutive spinal fusions and showed a reduction in infection rate from 2.6% to 0.2%.⁷

Eight meta-analyses have been published since 2014 reporting on the pooled risk for SSI from up to 16 studies with and without the use of topical vancomycin in spinal surgery. Each meta-analysis found a statistically significant improvement in favour of the use of topical vancomycin, with odds ratios for SSI ranging from 0.11 to 0.43.¹⁴ A single retrospective clinical study has reported initial results with the use of topical vancomycin for surgical prophylaxis in total hip arthroplasty and periarticular tibia fractures. 125 consecutive patients who underwent THA received either intravenous cefazolin alone or in addition to 2 grams of vancomycin powder. There was a significantly lower infection rate for patients receiving topical vancomycin, and there were no adverse events reported.^{15,16}

Otte et al. assessed the use of intrawound VP in revision total knee arthroplasty (TKA) and revision THA and found the infection rates in patients receiving intrawound VP was significantly lower than in patients who received no intrawound VP, 0.0% vs. 3.89%, respectively.¹⁷ In a prospective randomized controlled trial comparing 433 patients receiving VP to a control group of 474 patients receiving no VP, Tubaki et al. found no statistical difference in infection rates (1.6% in both groups). The authors hypothesized that the addition of VP may not be effective when the incidence of postoperative infection is low.¹⁸

Johnson et al studied the local and serum vancomycin concentration levels after topical administration of vancomycin. They found that topical vancomycin provides a highly therapeutic intrawound concentration, with low systemic absorption.¹⁹

CONCLUSION

The present study concluded that the rate of the infection was found to be 6.66% in the vancomycin-treated and 11.11% in the non-vancomycin treated group.

REFERENCES

- Zmistowski B, Restrepo C, Hess J, Adibi D, Cangoz S, Parvizi J. Unplanned readmission after total joint arthroplasty: rates, reasons, and risk factors. *J Bone Joint Surg Am.* 2013; 95: 1869–76.
- Ilchmann T, Zimmerli W, Bolliger L, Graber P, Clauss M. Risk of infection in primary, elective total hip arthroplasty with direct anterior approach or lateral transgluteal approach: a prospective cohort study of 1104 hips. *BMC Musculoskelet Disord.* 2016;17:471.
- Jämsen E, Varonen M, Huhtala H, et al. Incidence of prosthetic joint infections after primary knee arthroplasty. *J Arthroplasty.* 2010;25(1):87–92.

4. Adeli B, Parvizi J. Strategies for the prevention of periprosthetic joint infection. *J Bone Joint Surg Br.* 2012;94(11 Suppl A):42–6.
5. Stall AC, Becker E, Ludwig SC, Gelb D, Poelstra KA. Reduction of postoperative spinal implant infection using gentamicin microspheres. *Spine.* 2009;34 (5):479–83.
6. Hanssen AD. Local antibiotic delivery vehicles in the treatment of musculoskeletal infection. *Clin Orthop Relat Res* 2005; 437: 91–6.
7. Sweet FA, Roh M, Sliva C. Intra-wound application of vancomycin for prophylaxis in instrumented thoracolumbar fusions: efficacy, drug levels, and patient outcomes. *Spine.* 2011;36(24):2084–8.
8. Lazar HL, Barlam T, Cabral H. The effect of topical vancomycin applied to sternotomy incisions on postoperative serum vancomycin levels. *J Card Surg.* 2011;26(5):461–5.
9. Hidron AI, Edwards JR, Patel J, et al. NHSN annual update: antimicrobial resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006-2007. *Infect Control Hosp Epidemiol.* 2008;29(11):996–1011.
10. Anderson DJ, Sexton DJ, Kanafani ZA, Auten G, Kaye KS. Severe surgical site infection in community hospitals: epidemiology, key procedures, and the changing prevalence of methicillin-resistant *Staphylococcus aureus*. *Infect Control Hosp Epidemiol.* 2007;28(9):1047–53.
11. Huiras P, Logan JK, Papadopoulos S, Whitney D. Local antimicrobial administration for prophylaxis of surgical site infections. *Pharmacotherapy.* 2012;32(11):1006–19.
12. Fleischman AN, Austin MS. Local Intra-wound Administration of Powdered Antibiotics in Orthopaedic Surgery. *J Bone Jt Infect* 2017; 2(1):23-8. doi:10.7150/jbji.16649. Available from <http://www.jbji.net/v02p0023.htm>
13. Vander Salm TJ, Okike ON, Pasque MK, et al. Reduction of sternal infection by application of topical vancomycin. *J Thorac Cardiovasc Surg.* 1989;98:618–22.
14. Xiong L, Pan Q, Jin G, Xu Y, Hirche C. Topical intra-wound application of vancomycin powder in addition to intravenous administration of antibiotics: A meta-analysis on the deep infection after spinal surgeries. *Orthop Traumatol: Surg Res.* 2014;100(7):785–9.
15. Omrani FA, Emami M, Sarzaeem M, Zarei R, Yeganeh A. The effect of intra-wound vancomycin powder application in reducing surgical site infections after total hip arthroplasty. *Biosci Biotechnol Res Asia.* 2015;12(3):2383–6.
16. Singh K, Bauer JM, LaChaud GY, Bible JE, Mir HR. Surgical site infection in high-energy peri-articular tibia fractures with intra-wound vancomycin powder: a retrospective pilot study. *J Orthop Traumatol.* 2015;16(4):287–91.
17. Otte JE, Politi JR, Chambers B, Smith CA. Intra-wound vancomycin powder reduces early prosthetic joint infections in revision hip and knee arthroplasty. *Surg Technol Int.* 2017;30:284–9.
18. Tubaki VR, Rajasekaran S, Shetty AP. Effects of using intravenous antibiotic only versus local intra-wound vancomycin antibiotic powder application in addition to intravenous antibiotics on postoperative infection in spine surgery in 907 patients. *Spine (Phila Pa 1976)* 2013;38:2149–55.
19. Johnson JD, Nessler JM, Horazdovsky RD, Vang S, Thomas AJ, Marston SB. Serum and wound vancomycin levels after intra-wound administration in primary total joint arthroplasty. *J Arthroplasty.* 2017 Mar;32(3):924-28.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882. This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Anshul Dahuja, Kapil Bansal, Rashmeet Kaur, Jagdeep Singh, Radhey Shyam, Nikhil Gupta. Role of Topical Vancomycin in Hip Arthroplasty: A Retrospective Study. *Int J Med Res Prof.* 2021 Mar; 7(2): 40-42. DOI:10.21276/ijmrp.2021.7.2.010