ORIGINAL ARTICLE

CONTENTS

Vancomycin powder as a preventive measure for wound infection in total hip arthroplasty: a prospective cohort study

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ABSTRACT

Aim: To compare the results of use of vancomycin powder in the prevention of wound infection in operations of hip replacement that is total to a control group.
Materials and Methods: 40 patients undergoing total hips arthroplasty during period (January 2021 to January 2022). Patients were allocated in a random way into two categories so that one group received vancomycin powder and served a study group; the other group received no such intervention and served as a control group. Patients underwent steps: after completion of surgery, regular closure in layers was done; drain was inserted into sub-muscular layers while vancomycin powder (1 gm) was put in subcutaneous layer before skin closure; drain was closed for two hours and then reopened.
Results: Superficial infection was seen in 1 (5.0%) and 2 (10.0%), in vancomycin category & group of control and variation was insignificant statistically (p=1.0). Deep infection was seen in 0 (0.0%) and 3 (15.0%), in vancomycin category and group of control, and variation was insignificant statistically (p=0.231). Wound complication was seen in 2 (10.0%) and 0 (0.0%), in vancomycin group and group of control, respectively and variation was insignificant statistically (p=0.487). Return to operating room was seen in 1 (5.0%) and 1 (5.0%), in vancomycin category and category of control, respectively and variation was insignificant statistically (p=1.0). Peri-prosthetic fracture was not reported.
Conclusions: Utilization of powder of vancomycin is safe and efficient way in preventing deep wound infection accompanying total hip arthroplasty but small sample size herein suggested need for further future studies to validate our results.

KEY WORDS: vancomycin powder, prevention of wound infection, total hip arthroplasty

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INTRODUCTION

When pathogenic organisms develop in a wound and cause both local symptoms and signs finally a systemic inflammatory reaction, causing surgical site infection [1]. A greater number of patient- or surgery-specific risk factors are associated with higher infection rates [2, 3]. Diabetes mellitus, rheumatoid arthritis, obesity, and smoking were risk factors for patients. Complications in association with total hip replacement which are till now very substantial include infection. During last thirty years, alternative management options have been introduced to enhance clearance of infection while keeping on joint function during therapy and enhance results of reimplantation. The best course of treatment is typically thought to involve removing the implant, performing a complete debridement, and then administering systemic and local antibiotic therapy using impregnated spacers. The disease's heterogeneity is one of the challenges in treating infected THA. Numerous bacteria types that are sensitive to different antibiotics, present a challenge for surgeons and medical professionals. Then, while juggling the patient's comorbidities, the reconstruction must be planned in the context of an aberrant soft tissue and bone state. The gold standard that is suggested appears to be challenging to apply to the total patients, and there is a dearth of excellent literature discussing alternatives [4]. In general, individuals who have contraindication for revision surgery are treated with suppressive antibiotics. This is typically brought on by severe or numerous medical comorbidities and people with short life spans. Recent research on the exclusive use of antibiotic therapy is few. Trebse et al. [5] conducted a prospective follow-up of twenty-four individuals with culture-confirmed infection. The only kind of treatment for seven of these individuals was combined antibiotic medication. Despite the fact that there were no recurrences over the three-year period of follow-up, this sample size is too little to get firm results. In patients with early type I and type III infections, surgical debridement combined with therapy using antibiotic and retention of implant may be taken into consideration. According to reports, the eradication rate ranges from 26 to 71% [6].

Table 1. Demographic characteristics and duration of follow up.

Characteristic	Vancomycin group, n = 20	Control group, n = 20	p
Age (years)			
Mean ±SD	59.05±10.02	60.35±8.15	0.655^{NS} (I)
Range	45 -78	44 -79	
Gender			
Male, n (%)	9 (45.0 %)	10 (50.0 %)	0.752^{NS} (C)
Female, n (%)	11 (55.0 %)	10 (50.0 %)	
BMI (kg/m²)			
Mean ±SD	26.85±5.11	27.05±4.81	0.899^{NS} (I)
Range	18 -36	18 -35	
Duration of follow up (months)			
Mean ±SD	9.00±3.36	9.85±2.37	0.361^{NS} (I)
Range	5 -15	6 -14	

n: number of cases, SD: standard deviation, BMI: body mass index, I: independent t-test, C: chi-square test, NS: not significant.

Table 2. Chronic medical illnesses and smoking

Characteristic	Vancomycin group, *n* = 20	Control group, *n* = 20	*p*
DM, *n* (%)	3 (15.0 %)	4 (20.0 %)	1.000^{NS} (Y)
HT, *n* (%)	8 (40.0 %)	9 (45.0 %)	0.749^{NS} (C)
IHD, *n* (%)	3 (15.0 %)	4 (20.0 %)	1.000^{NS} (Y)
COPD, *n* (%)	3 (15.0 %)	4 (20.0 %)	1.000^{NS} (Y)
Smoking, *n* (%)	11 (55.0 %)	12 (60.0 %)	0.749^{NS} (C)

n: number of cases, DM: diabetes mellitus, HT: hypertension, IHD: ischemic heart disease, COPD: chronic obstructive pulmonary disease, Y: Yates correction, C: chi-square test, NS: not significant.

Consider using an open strategy that includes thorough debridement and lavage. A profound periprosthetic joint infection (PJI) is one of the more severe surgical consequences. PJI risk is often estimated to be 1%. However, there is a lot of variation in this number in the research that is currently available, with numbers ranging from 0.57% to 2.23% [7]. An evaluation that is retrospective including 265 subjects who underwent hip arthroplasty that is total was carried out by Dial et al. [8]. They followed 137 of them in a group of vancomycin powder as they received it at moment of closure of the wound, but the initial 128 individuals in the group of control did not. They arrive at conflicting conclusions and suggested additional, larger sample size investigations. In Iraq, the information about the role of vancomycin powder in the protection against infection of wound in operations of hip replacement that is total is scares; therefore, the aim of the current study was to compare the results of use of vancomycin powder in the prevention of wound infection in operations of total hip replacement to a control group.

AIM

The aim of this research is to compare the results of use of vancomycin powder in the prevention of wound infection in operations of hip replacement that is total to a control group.

MATERIALS AND METHODS

The current comparative interventional investigation was done in the orthopedic unit in the surgical department belonging to Adiwaniyah teaching Hospital, Adiwaniyah Province, Iraq. The study enrolled 40 patients undergoing total hips arthroplasty during the period extending from January 2021 to January 2022. Patients with rheumatoid arthritis or any condition with immune suppression were excluded from the study. Patients were allocated in a random manner into two categories so that one of them were given vancomycin powder and served a study group; whereas, the other group received no such intervention and served as a control group. In the study group, patients underwent the following steps: after completion of the surgery, regular closure in layers was done; drain was inserted into the sub-muscular layers while vancomycin powder 1 gm was put in the subcutaneous layer before skin closure; the drain was closed for two hours and then reopened. Patients were followed up for a period ranging from 5 to 15 months. The following variables were

Table 3. Indications of total hip replacement

Characteristic	Vancomycin group, n = 20	Control group, n = 20	p
Osteoarthritis, n (%)	17 (85.0 %)	16 (80.0 %)	1.000 ^{NS} (Y)
Avascular necrosis, n (%)	3 (15.0 %)	4 (20.0 %)	1.000 ^{NS} (Y)

n: number of cases, Y: Yates correction, NS: not significant

Table 4. Outcome and complications

Characteristic	Vancomycin group *n* = 20	Control group *n* = 20	*p*
Superficial infection, *n* (%)	1 (5.0 %)	2 (10.0 %)	1.000 ^{NS} Y
Deep infection, *n* (%)	0 (0.0 %)	3 (15.0 %)	0.231 ^{NS} F
Wound complication, *n* (%)	2 (10.0 %)	0 (0.0 %)	0.487 ^{NS} F
Return to operating room, *n* (%)	1 (5.0 %)	1 (5.0 %)	1.000 ^{NS} Y
Peri-prosthetic fracture, *n* (%)	0 (0.0 %)	0 (0.0 %)	---

n: number of cases; Y: Yates correction; F: Fischer exact test; NS: not significant

taken into consideration: age, gender, body mass index (BMI), chronic medical illness, indications of operation and outcome and complications. Outcome measures included: superficial infection, deep infection, wound complication, return to operation room and peri-prosthetic fracture.

STATISTICAL ANALYSIS

Data were analyzed based on statistical package for social sciences (SPSS, version 16). The variable demonstration was done using percentage, counts, average, range and standard deviation. Independent samples t-test was applied to contrast means of two groups. Chi-square, Yeats correction and Fischer exact tests were used to compare proportions between groups when statistical assumptions were established. The level of significance in the study was at $p \leq 0.05$.

RESULTS

Demographic characteristics and duration of follow up are shown in table 1. Averages of age, body mass index and duration of follow up showed no statistical variation between vancomycin category and control group (p>0.05). No significant difference was also noticed in the frequency distribution of patients according to gender between vancomycin group and control group (p=0.752).

The rates of chronic medical illnesses and smoking are shown in table 2. There was no significant difference in the rates of diabetes mellitus, chronic obstructive pulmonary disease, essential hypertension, smoking and heart disease (p>0.05).

Indications of total hip replacement are shown in table 3. Osteoarthritis was the main indication as it accounted for 17 (85.0%) and 16 (80.0%) in vancomycin group and control group, respectively and it was followed by avascular necrosis which was accounted for 3 (15.0%) and 4 (20.0%), respectively. There was no significant variation in the rate of indications between vancomycin group and control group (p=1.0).

Outcome and complications are shown in table 4. Superficial infection was seen in 1 (5.0%) and 2 (10.0%), in vancomycin group and control group, respectively and variation was statistically insignificant (p=1.0). Deep infection was seen in 0 (0.0%) and 3 (15.0%), in vancomycin category and category of control, respectively and variation was statistically insignificant (p=0.231). Wound complication was seen in 2 (10.0%) and 0 (0.0%), in vancomycin category and group of control, respectively and variation was statistically insignificant (p=0.487). Return to operating room was seen in 1 (5.0%) and 1 (5.0%), in vancomycin category and group of control, respectively and variation was statistically insignificant (p=1.0), peri-prosthetic fracture was not reported.

DISCUSSION

Surgical site infection is an important concern to all surgeons because of significant morbidity linked to that particular complication [9-11]. Contaminations at the operative site have a substantial participation in mortality and morbidity in postoperative care. Numerous microbiological, patient-related, and procedure-related variables might increase the risk of surgical site infection. Optimizing patient variables and the use of a range of evidence-based pharmacologic and non-pharmacologic interventions are key components in the prevention of postoperative infection. Antimicrobial prophylaxis, which has been demonstrated to be successful at lowering the risk of surgical site infection, is at the forefront of these precautions [9]. Following

the use of spinal instrumentation, deep surgical site infections have been demonstrated to be reduced by vancomycin powder, according to extensive research in the spine literature [12, 13, 23, 24]. A recent study showing a decreased occurrence of PJI after revision TKA or THA utilizing vancomycin was published [14, 21, 22, 25]. Vancomycin's usefulness and safety during THA, however, are not well known. One of the problems specific to endoprosthetics is that the inclusion of vancomycin results in a higher rate of wear of the implanted body. This subject was tackled by a mechanical in-vitro study, but the results did not show higher rates of third body polyethylene wear after cyclic administration with the vancomycin that was added intra-articularly [15-17]. In this investigation we found that vancomycin powder was able to prevent deep infection rate and reduce superficial wound infection, but because of small samples size, the difference did not reach statistical significance. However, we found that sterile wound complications were more frequently encountered in study group when compared to control group; despite that, the difference was statistically not significant. In the study of Dial et al., [8] there was significant reduction in rate of deep wound infection following application of vancomycin powder; however, they noticed that formation of sterile seroma that require management surgically was more frequent in subjects given vancomycin powder [18-20].

CONCLUSIONS

In conclusion, the administration of powder of vancomycin is safe and efficient way in preventing deep wound infection accompanying total hip arthroplasty but the small sample size in this study suggested the need for further future studies to validate our results.

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CONFLICT OF INTEREST

The Author declare no conflict of interest

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