RESEARCH ARTICLE

Incidence of infection in carpal tunnel surgery with and without the use of local antibiotics

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Abstract

Objective: To compare the infection rate in patients who underwent carpal tunnel surgery with and without instilling local antibiotics into the surgical wound.

Method: The retrospective cohort study was conducted at the Department of Surgery, Unit of Neurosurgery, Government Naseer Ullah Babar Memorial Hospital, Peshawar, Pakistan, and comprised data from July 2019 to July 2021 related to non-diabetic patients without any comorbidity who had undergone fresh carpal tunnel surgery. The cases had been operated by two surgeons having a different approach to preventing infection in carpal tunnel surgery cases. The surgeon in group A did not use any local antibiotics after completing the surgery, while the surgeon in group B instilled local gentamicin in the open wound for 3 minutes after completing the nerve release. All patients were put on oral antibiotics for a period of 5 days after the procedure in both the cohorts, and were assessed fortnightly for any infection and removal of stitches. Demographics of the patients, use of antibiotics and the occurrence of infection were recorded on a proforma. Data was analysed using SPSS 20.

Results: Of the 177 patients operated during the period, 13(7.3%) were discarded owing to missing data. Of the 164(92.7%) patients analysed, 138(84.14%) were females and 26(15.85%) were males. The overall mean age was 32.46±8.97 years. The total surgeries conducted were 176; 96(54.54%) in group A and 80(45.45%) in group B. Infections were found in 3(1.7%) patients; all in group A (p=0.160).

Conclusion: Although not statistically significant, instillation of local antibiotics may play a role in preventing surgical site infections in carpal tunnel surgery cases.

Keywords: Topical antibiotics, Local antibiotics, Carpal tunnel surgery, Gentamicin, Infection. (JPMA 73: 21; 2023)

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Introduction

Surgical site infections (SSIs) are a major cause of morbidity and mortality worldwide.[1] In clean procedures, like the hand surgery, though the rate of infections is low, SSIs may lead to serious disability due to functional impairment[2-4] since hand is a very useful organ of the human body. Carpal tunnel syndrome (CTS) is a common condition, yet the exact prevalence among the general population in Pakistan is not known, with studies having reported it to range from 10% to 21% among certain professions.[5,6] The use of antibiotics for many clean surgical procedures to prevent SSIs is recommended, but the use of such antibiotics for short clean procedures of the hand, like trigger finger release and CTS, is not preferred, as there is no likely outcome benefit.[7-10] Also, the use of preoperative antibiotics has been associated with adverse outcomes, like infections, antibiotic resistance and systemic allergic reactions.[11] Yet, the administration of antibiotics before surgery has increased over the years and many surgeons prefer to use them during CTS surgery.[12]

Antibiotics, like cephalosporins, aminoglycosides, glycopeptides, chloramphenicol and bacitracin, are used locally to prevent SSIs.[13] Compared to systemic antibiotic therapy, topical or local delivery of antibiotics has many potential benefits, like high and sustained concentrations at the site of infection, less volume of the antibiotic solution, less potential for systemic absorption and toxicity, use of antibiotics with low bioavailability, easy to use, and less potential for antibiotic resistance. However, they can cause contact dermatitis, local hypersensitivity and interference with wound healing, and there is no standardised criterion for their use.[14]

Gentamicin belongs to the aminoglycosides class of antibiotics, which are broad-spectrum and have activity against gram-negative bacteria and most of the gram-positive ones, but are inactive against anaerobes. SSIs after hand surgery is usually caused by gram-positive organism,

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and gentamicin has shown some activity against these organisms.[15] Furthermore, locally instilled antibiotics also lack the systemic side effects and adverse reactions associated with intravenous (IV) administration.[13]

The current study was planned to compare the infection rate in patients who underwent CTS with and without instilling local antibiotics into the surgical wound.

Materials and Methods

The retrospective cohort study was conducted at the Department of Surgery, Unit of Neurosurgery, Government Naseer Ullah Babar Memorial Hospital, Peshawar, Pakistan, and comprised data from July 2019 to July 2021 related to non-diabetic patients without any comorbidity who had undergone CTS for the first time and for whom follow-up record was available. Diabetic patients, those on steroids or having other co-morbidity were excluded as that would have created a bias in the study.

After approval from the institutional ethics review committee, data was retrieved and for all CTS surgeries done by two surgeons having different approaches towards infection prevention in CTS cases. The surgeon in group A did not use any local antibiotics after completing the surgery, while the surgeon in group B instilled local gentamicin in the open wound for 3 minutes after completing the nerve release. Operative techniques and sterilisation method for both groups were the same since all surgeries had been performed in the same settings. Since no uniform criterion is found for sterilisation of the operative instruments, and these sterilisation techniques and protocols vary from hospital to hospital, surgeries done by the two surgeons in private setups were excluded to prevent bias. with available follow-up visit record in the OPD register.

Patients were operated upon on the basis of clinical reasons and nerve conduction studies (NCS). All patients with relevant symptoms of hand numbness and pain and having at least mild to moderate degree of median nerve block at the wrist on NCS were subjected to surgery. The entire hand and forearm were prepped with Pyodine scrub before the instilling of local anaesthetic with adrenaline in the incision site. The relevant areas were scrubbed with Pyodine solution 5 minutes before the incision. An incision was given in the midline using Kaplan lines and was about 4-5cm in length starting from the distal wrist crease. The nerve was released after cutting the transverse carpal ligament. Haemostasis was secured and the wound was washed with 0.9% normal saline and dried. The surgeon in group B instilled a solution of gentamicin (Gentacin) in the wound before the closure (Figure 1), while the surgeon in group A did not use any antibiotics.

The wound was closed with interrupted vertical mattress sutures with 2/0 Prolene. Both the surgeons put the patients on oral antibiotics for a period of 5 days after the procedure. Guidelines and instructions about wound care and follow-up visits' details were given verbally to the patients and were also written on the discharge summary.

Figure-1: Completion of nerve release at the wrist. The star indicates the median nerve, while the arrow points to the cut edge of transverse carpal ligament. Local gentamicin solution was instilled at this stage before wound closure.

Table-1: Centres for Disease Control and Prevention (CDC) criteria for surgical site superficial and deep infections.

Superficial Infection
Infection that occurs within 30 days after surgery, and involves the skin and subcutaneous tissues of the incision and the patient fulfils one of the following conditions:
A. Purulent discharge from the incision site.
B. Organisms are isolated from aseptically obtained culture of fluid/tissue from the incision.
C. At least 1 of the following signs or symptoms of infection (pain/tenderness, localized swelling, redness, or heat) and the superficial incision is deliberately opened by the surgeon, and is culture-positive or either not cultured. A culture-negative finding does not meet this criterion.
D. Diagnosis of superficial incisional SSI by the surgeon or attending physician.
Deep Infection
Infection occurs within 30 days after the operative procedure in case of no implants are left in place or within one year if implants are in place and the infection appears to be related to the operative procedure and involves deep soft tissues (eg, fascial and muscle layers) of the incision and patient has at least 1 of the following:
A. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
B. A deep incision dehisces spontaneously or is opened deliberately by a surgeon and is either culture positive or else not cultured, and the patient has at least one of the following signs or symptoms: fever (38°C)/localized pain/tenderness. A culture-negative finding does not meet this criterion.
C. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
D. Diagnosis of a deep incisional SSI by the surgeon or an attending physician.

SSI: surgical site infection.

They were asked to strictly adhere to the wound cleaning measures, and were guided about the protocols for changing the dressings.

The patients were assessed fortnightly, and 30 days after the surgery for any infection in the follow-up visits to the outpatient department (OPD).

Infection was assessed using the Centre for disease control and prevention (CDC) criteria[16] for wound dehiscence, discharge, or unusual pain (Table 1).

Data, like gender, age, use of antibiotics and the occurrence of infection, was recorded for each patient using a proforma (Annexure).

Data was analysed using SPSS 20. Fisher's exact test was used, and one-sided $p<0.05$ was taken as significant because of a single-tailed hypothesis that the rate of infection in the antibiotics group would be smaller.

Results

Of the 177 patients operated during the period, 13(7.3%) was discarded owing to missing data. Of the 164(92.7%) patients analysed, 138(84.14%) were females and 26(15.85%) were males. The overall mean age was 32.46±8.97 years. The total surgeries conducted were 176; 96(54.54%) in group A and 80(45.45%) in group B. Infections were found in 3(1.7%) patients (Figure 2); all in group A (p=0.160) (Table 2). Those with infection showed

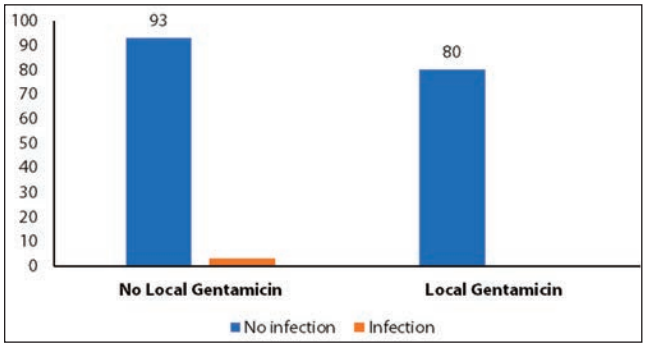

Figure-2: Histogram showing the rate of infection with and without the use of local antibiotics.

Table-2: Rate of infection with and without the use of local antibiotics.

Variable	Value
Surgery without use of antibiotics	
No infection	93
Infection	3
Surgeries with use of local gentamicin	
No infection	80
Infection	0
Pearson Chi-Square test	2.543
Fisher's Exact Test (1-sided)	0.160
No. of Valid Cases	176

signs of redness at the wound site and slight discharge, or pain, and restriction of hand functions. The infections were reported in the early postoperative period and were managed by taking a sample for culture and sensitivity testing of the wound site. While waiting for the results, they were given broad-spectrum antibiotics along with debridement of the wound in 2(66.6%) cases due to the presence of deep infection. No patient in either group showed signs and symptoms of peripheral neuropathy.

Discussion

CTS accounts for about 43% of all hand-related surgeries[17] and 31-49% of surgeons use antibiotics during these operations for the prevention of infection even if some are coerced into doing so by the guidelines set by various insurance companies for the prevention of infection.[9,10,17] Topical or local antibiotics, like gentamicin, colistin and vancomycin, are used to prevent SSIs, and they have been proven to be effective in preventing such complications.[13,18] Gentamicin has been used as beads and collagen wafers in orthopaedic and cardiac surgeries, and does have a role in reducing SSIs (19, 20). The use of local antibiotics solution, like gentamicin, for minor surgeries like CTS has not been studied, though some has shown promising result with the use of ointment for preventing infection.[18]

The infection rate in the current series overall was 1.7%, but since all the infections were noted in group A patients who had been operated upon without the use of local antibiotics, the infection rate rather high at 3.12%. Literature has reported infection rates ranging from 0.36% to 0.60%.[2,3,17] However, one study reported it to be as high as 11%, which is unusual for a short clean case.[18]

No infections were observed in the current study's group B in which patients were given local gentamicin. But the inter-group difference was not significant (p=0.160). Studies with comparatively very large retrospective and prospective cohorts of CTS surgery have failed to show any significant correlation between the prevention of infection and antibiotic use.[2-4,12,17] One very big reason for this has been the very small rate of infection in a clean surgery, like the CTS, and one author claimed that it would be impossible to find such a correlation.[3] The antibiotic used in these studies were either intravenously administered or locally applied as a topical ointment (chloramphenicol) to the wound as was done in a study in which a significant reduction in the rate of infection (from 11% to 6.6%; p=0.010) in minor dermatological surgeries was found.[18] Also, gentamicin-impregnated beads and collagen sponges are used in orthopaedic, colorectal and cardiac surgeries for the prevention of infection, and have shown

promising results by reducing the rate of infection by about 4.7% to 12%.[19,20] Pure gentamicin solution in itself has been used at wound sites in orthopaedic surgery as an adjunct to systemic antibiotics with a significant (10.2%) reduction in the rate of infection.[21] Literature search showed no study on he use of local gentamicin and local antibiotics in CTS surgery.

Gentamicin, being an aminoglycoside, is considered a neurotoxic drug and has been reported to cause adverse effects in the form of ototoxicity, peripheral neuropathy, encephalopathy and autonomic transmission blockade.[22] No such effect of neurotoxicity was reported in the current series. It also interferes with peripheral nerve transmission through the neuromuscular blockade, which is significant only in cases of diseases like myasthenia gravis.[22] In the early postoperative period, patients are unable to use their hand, being wrapped in a bandage, also making the effects of neuromuscular blockade difficult to ascertain.

The current study has several limitations, including those inherent in retrospective studies. Discrepancies in the follow-up data led to the loss of many patients as there was no source of communication to establish contact with them. Besides, patients in the study setup usually belonged to a low socioeconomic class, were uneducated and did not follow the given instructions for wound care properly. The study did not take into account such factors as well as those responsible for causing wound infections, such as obesity.

These limitations can be overcome by a randomised controlled trial with a very large sample size, but as mentioned, discrepancies in the sterilisation techniques and surgeons' preference are a big hindrance in the way of pursuing such studies in the current setup.

Conclusion

Although not statistically significant, local instillation of antibiotics played a role in preventing SSIs in CTS surgery, but due to the low rate of infection reported, this needs to be proven by very large prospective cohorts. There was no report of any harmful effect on the nerves, like peripheral neuropathy, with the use of local antibiotics.

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Conflict of Interest: None.

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Author Contribution:

BK: Conceived idea, data collection, review.
IA: Data collection, data analysis, interpretation.
SU: Data collection, analysis, drafting.
BJ: Data analysis, literature review, drafting.