DOI: 10.7860/IJARS/2024/69439.2987

Original Article

Surgery Section

Surgical Site Infections in Single-dose versus Multiple-dose Broad-spectrum Intravenous Antibiotic Prophylaxis in Clean Surgeries: A Quasi-experimental Study

C Shobha[1], Amit Kumar[2], Bhimanagouda V Goudar[3], Shaileshkumar M Emmi[4]

ABSTRACT

Introduction: Surgical Site Infections (SSIs) constitute a prevalent nosocomial concern among surgical patients. The incidence of SSIs typically ranges from 1-2% in the context of clean surgeries, irrespective of the use of antibiotic prophylaxis. Frequently, a single preoperative dose of antibiotics administered up to 60 minutes before surgery suffices.

Aim: To compare the rates of postoperative infections following a single preoperative dose of prophylactic antibiotics with those receiving multiple postoperative doses.

Materials and Methods: This quasi-experimental study was conducted at the Surgery Department of Kumareshwara Hospital in Bagalkot, Karnataka, India. Participants included individuals aged over 18 years undergoing elective clean surgeries, with their informed consent. Patients with co-morbidities or pre-existing infections at the surgical site were excluded from the study. A total of 161 cases were enrolled, divided into two groups: Group A (single dose of broad-spectrum i.v. antibiotic with 70 patients) and Group B (multiple doses of the same broad-spectrum antibiotic with 91 patients). Independent parameters of outcome variables were analysed using the Chi-square test and Student's t-test.

Results: The mean age of study participants was 41.25±13.47 years. The incidence of SSI in Group A was 1.42%, while in Group B, it was 2.20%. The mean duration of hospital stay was shorter in Group A (6.11±3.87 days) compared to Group B (7.60±4.08 days).

Conclusion: In conclusion, the study suggests that the incidence of SSIs in both groups is similar and statistically insignificant for clean surgeries. Importantly, the hospital stay was shorter in the group receiving a single preoperative dose of antibiotics compared to multiple doses of antibiotics.

Keywords: Chemoprophylaxis, Hernioplasty, Hospital stay, Nosocomial infection, Spectrum antibiotic

INTRODUCTION

Surgical Site Infections (SSIs), which encompass infections within the surgical site, pose a significant burden on both patients and healthcare systems worldwide. The classification by the Centres for Disease Control and Prevention (CDC) into superficial, deep space, and organ space infections has established a foundational framework for understanding the diverse nature of SSIs [1-3]. Despite considerable efforts, SSIs remain prevalent, contributing to an estimated 500,000 infections annually and accounting for a noteworthy 21.8% of all Healthcare-associated Infections (HAIs) in the United States [4,5].

Observations indicate a disparity in SSI incidence between developed and developing nations, emphasising the need for tailored preventive measures [5]. A study conducted in India notably revealed varying rates between minimally invasive and open surgeries, shedding light on the nuanced factors influencing SSIs in different surgical approaches [6]. In the United States, the variability in SSI rates across surgery types underscores the complexity of this issue, with clean surgeries exhibiting lower incidence compared to emergency colon surgeries in unsterile conditions [7].

The aftermath of SSIs extends beyond the immediate postoperative period, significantly impacting patients' quality of life. The substantial increase in hospital days, totaling 3.7 million annually, coupled with excess costs exceeding $1.6 billion, underscores the urgency of effective preventive measures [8-10]. Patients who experience SSIs face a higher likelihood of hospital readmission, increased Intensive Care Unit (ICU) stays, and a doubled risk of mortality compared to those without SSIs, highlighting the critical need for intervention [11].

Effective prevention of SSIs involves a multi-faceted approach, including Surgical Antibiotic Prophylaxis (SAP) and chemoprophylaxis for surgical procedures. SAP, encompassing the administration of antibiotics before surgery, is crucial for preventing SSIs, recognising the invasive nature of surgical interventions [12]. SSIs in orthognathic surgery should follow-up on patients for at least one year since SSIs are defined as infections that occur either within 30 days after surgery or within one year after the implantation of foreign material. SSIs would have been under-reported if the study had solely focused on the first 30 days after surgery. Reasons for a later onset of infection (after 30 days) are multifactorial [13]. Chemoprophylaxis, specifically in cardiac and orthopaedic procedures, incorporates decolonisation programs using intranasal mupirocin and chlorhexidine-gluconate baths, targeting staphylococci, notably S. aureus, common in incision site infections after clean surgeries [14].

In light of existing literature, there is a need for a more nuanced understanding of the factors influencing SSI incidence and the effectiveness of preventive strategies. The study by Kudchadkar AA and Bhounsule SA, involving a diverse patient cohort and a focus on prophylactic antibiotic prescription patterns, provides valuable insights into SSI development [15]. Additionally, the emphasis on Cefazolin, a first-generation cephalosporin, as a preferred choice for surgical prophylaxis in clean surgeries adds specificity to preventive measures [16-18]. Treatment strategies for SSIs involve pathogen identification, source control through incision opening or drainage, immediate empiric antibiotic coverage, timely de-escalation, and local wound care [19]. These strategies aim to effectively manage SSIs and improve patient outcomes.

While antibiotic prophylaxis is standard practice in surgical settings to prevent SSIs, there might be limited evidence comparing different dosing regimens, especially in the context of clean surgeries. This study addresses the existing gap in the literature by comprehensively examining SSI incidence, preventive strategies, and the impact on patient outcomes. The findings have the potential to guide healthcare practitioners in tailoring preventive measures, improving patient care, and ultimately reducing the burden of SSIs. This study aimed to compare the rates of postoperative infections following a single preoperative dose of prophylactic antibiotics with those receiving multiple postoperative doses.

MATERIALS AND METHODS

This quasi-experimental study was conducted at Shri Nijalingappa Medical College and Research Centre in Bagalkot, Karnataka, India, from January 2020 to June 2021. Ethical clearance was obtained from the institute with Institutional Ethical Comittee approval number: SNMC/IECHSR/2019-20/A-19/1.2.

Inclusion criteria:

- Age group: 18 years and above
- Patients posted for elective clean surgeries
- Patients giving consent for the study

Exclusion criteria:

- Patients posted for emergency surgeries
- Patients with any pre-existing infection at the site of the skin incision
- Patients with immunocompromised status, co-morbid conditions, etc.
- Patients with pre-existing systemic infections who are on antibiotics

Sample size calculation: Sample size calculation was performed using Open Epi software version 2.3.1. At a 95% confidence level and 80% power of the study, α (two-tailed)=0.050, and at 95% confidence level, β=0.200 with 80% power of the study. The standard normal deviate for $\alpha=Z\alpha=1.960$. The standard normal deviation for $\beta=Z\beta= 0.842$.

Formula used: $n=(Z\alpha/2+Z\beta)^2 * (p1\ (1-p1)+p^2(1-p2))/(p1-p2)^2$.

According to a study conducted by Garg S et al., the proportion of subjects with SSI in single-dose antibiotics was 8% [2]. The proportion of subjects with SSI in multiple-dose antibiotics was 0%. The estimated sample size was 98≈100 in each group, i.e., 100 in the single-dose antibiotics group (Group A) and 100 in the multiple-dose antibiotics group (Group B).

Study Procedure

The process involved obtaining detailed medical histories, conducting thorough clinical examinations, and performing appropriate investigations. The study subjects were divided into two groups:

Group A: Patients received a single dose of broad-spectrum i.v. antibiotics according to the hospital's antibiotic policy.

Group B: Patients received multiple doses of the same broad-spectrum antibiotic.

In Unit A, considered Group A, patients undergoing clean surgery received a single prophylactic dose of i.v. cefazoline 2 g stat 60 minutes before the skin incision for surgeries lasting up to four hours. If the surgery exceeded four hours, an additional intraoperative dose was administered. In Unit B, considered Group B, patients received multiple doses (Inj. cefoperazone+Sulbactum, 1.5 gm, BD) of postoperative antibiotic prophylaxis for five days, including cefazoline 2 g stat 60 minutes before the skin incision for surgeries lasting up to four hours. Patients in both groups received multimodal analgesia.

Postoperatively, patients were examined for febrile episodes and signs of infection through clinical examination and relevant investigations. Dressings were changed on the 2nd postoperative day, and follow-up continued for 30 days in the outpatient department, checking for signs of SSI. Any wound discharge was sent for culture and sensitivity. In cases of suspected wound infection, a culture swab or aspiration was taken using a sterile syringe from the wound depth.

If postoperative infections occurred, patients were treated with antibiotics based on culture and sensitivity. Patients were discharged upon completing the i.v. antibiotic course and showing no signs of SSI.

STATISTICAL ANALYSIS

Data coding was performed, followed by entry into Microsoft excel and Statistical Package for Social Sciences (SPSS) software version 19.0. Normality was assessed using the Shapiro-Wilk's test and z-scores for skewness and kurtosis. Independent parameters of outcome variables were analysed using the Chi-square test and Student's t-test. Pearson's correlation coefficient was calculated. A p-value <0.05 was considered statistically significant.

RESULTS

Out of 200 patients (100 in each group), 39 patients (30 in Group A and 9 in Group B) were unaccounted for due to various reasons like loss to follow-up, premature discharge from the hospital, breach of sterile precautions, personal family obligations, and death. Consequently, the study comprised 161 patients undergoing clean surgeries, with 70 in Group A and 91 in Group B. The mean age of subjects in Group A was 37.46±14.69 years, and in Group B, it was 44.6±12.02 years. The mean age of study participants was 41.25±13.47 years. The largest number of patients (n=51) belonged to the age group of 51-60 years [Table/Fig-1].

In Group A, 56 (80%) patients were males. In Group B, 82 (90.1%) patients were males [Table/Fig-2].

Age group (years)	Group A		Group B		Total	
	Male	Female	Male	Female	Male	Female
18-20	10 (17.86%)	3 (21.43%)	0	2 (22.22%)	10 (7.25%)	5 (21.74%)
21-30	9 (16.07%)	4 (28.57%)	12 (14.63%)	1 (11.11%)	21 (15.22%)	5 (21.74%)
31-40	12 (21.43%)	5 (35.71%)	17 (20.73%)	1 (11.11%)	29 (21.01%)	6 (26.09%)
41-50	8 (14.29%)	0	24 (29.27%)	2 (22.22%)	32 (23.19%)	2 (08.70%)
51-60	17 (30.36%)	2 (14.29%)	29 (35.37%)	3 (33.33%)	46 (33.33%)	5 (21.74%)
Total	56 (100.0%)	14 (100.0%)	82 (100.0%)	9 (100.0%)	138 (100.0%)	23 (100.0%)

[Table/Fig-1]: Age group of the participants in Group A and Group B.

Gender	Group A n=70 (43.5%)	Group B n=91 (56.5%)	Total N=161 (100.0%)
Male	56 (80.0%)	82 (90.1%)	138 (85.7%)
Female	14 (20.0%)	09 (09.9%)	023 (14.3%)

[Table/Fig-2]: Distribution of gender in the group.
χ^2=3.303; df=1; p=0.110 Not significant

The majority of patients in Group A underwent excision procedures for benign tumours 24 (34.3%), while the majority of patients in Group B underwent Inguinal hernioplasty 43 (47.3%) [Table/Fig-3].

Diagnosis	Group A n=70 (43.5%)	Group B n=91 (56.5%)	Total N=161 (100.0%)
Carcinoma breast	01 (01.4%)	0	01 (00.6%)
Fibroadenoma breast	06 (08.6%)	03 (03.3%)	09 (05.6%)
Inguinal hernia	19 (27.1%)	43 (47.3%)	62 (38.5%)

Varicose veins	02 (02.9%)	05 (05.5%)	07 (04.3%)
Ventral hernia	04 (05.7%)	14 (15.4%)	18 (11.2%)
Hydrocoele	05 (07.1%)	14 (15.4%)	19 (11.8%)
Benign tumours	24 (34.3%)	05 (05.5%)	29 (18.0%)
Thyroid swelling	02 (02.9%)	03 (03.3%)	05 (03.1%)
Phimosis/paraphimosis	06 (08.6%)	01 (01.1%)	07 (04.3%)
Gynaecomastia	0	01 (0.1.1%)	01 (00.6%)
Tongue tie	01 (01.4%)	0	01 (00.6%)
Undescended testes	0	01 (0.1.1%)	01 (00.6%)
Varicocoele	0	01 (0.1.1%)	01 (00.6%)

[Table/Fig-3]: Distribution of patients according to the diagnosis.
Fisher's-exact test; p<0.001 Significant

In the present study, the incidence of Surgical Site Infection (SSI) in Group A was 1.42%, whereas in Group B it was 2.20%. Overall, SSI was found in 2.5% of the total number of patients. The incidence of SSI was statistically non significant between the groups (p-value=1.00) [Table/Fig-4-6].

SSI	Group A n=70 (43.5%)	Group B n=91 (56.5%)	Total N=161 (100.0%)
Present	01 (1.42%)	02 (02.2%)	3 (1.86%)
Absent	69 (98.57%)	89 (97.8%)	158 (98.13%)

[Table/Fig-4]: Incidence of SSI in the groups.
Fisher's-exact test; p=1.000; Not significant

[Table/Fig-5]: SSI of a case of umbilical hernia repair operated by subumbilical incision.

[Table/Fig-6]: SSI of a case of incisional hernia repair, after debridement.

The mean duration of hospital stay was significantly shorter in Group A (6.11±3.87 days) compared to Group B (7.60±4.08 days) with a p-value of 0.000033. Two out of three SSIs showed no organism growth, while one SSI showed Streptococcus species.

DISCUSSION

In the current study, there was no significant difference in the incidence of SSI in both groups. The mean duration of hospital stay was significantly shorter in Group A compared to Group B (p-value=0.000033). In the present study, the mean age in Group A was 37.46±14.49 years, and in Group B, it was 44.60±12.02 years. Similar age findings to the present study were reported by Ahmed SO et al., where the mean age was 41.1±14.8 years [20].

In the present study, there were 85.7% males and 14.3% females. Specifically, 80% males and 20% females were in 43.5% of Group A, while Group B comprised 90.1% males and 9.9% females. This contrasts with a study by Madhu BS et al., where the study group consisted of 60% males and 40% females, and the control group had 56% males and 44% females [21]. In contrast to the present study, a 2019 study by Das S et al., in West Bengal reported a gender distribution of 46.7% females and 53.3% males [22].

Regarding surgical procedures, in the present study, 44.3% of the patients in the study group underwent excision surgery, and 41.4% of the control group underwent Lichtenstein hernioplasty. This differs from Bendre DM where 46% in the study group underwent hernioplasty/herniorrhaphy, and 61% in the control group had hernioplasty/herniorrhaphy [23].

In the present study, the incidence of SSI was 1.42% in the study group (Group A-single-dose antibiotic group) and 2.2% in the control group (Group B-multiple-dose antibiotic group), with a non significant p-value of 1.000. Similar results were obtained in a study by Bendre DM [23].

In contrast to the present study, Bendre DM, reported insignificant differences in mean hospital stay between single-dose and multiple-dose antibiotic groups [23]. Similarly, Tamayo E et al., reported non significant differences in hospital stay between the study and control groups [24].

A study by Akhter MSJ et al., indicated that hospital stays of less than one week, 1-2 weeks, and more than two weeks had SSI incidences of 1.7%, 15.5%, and 39.1%, respectively [25]. Akhter MSJ et al., also showed that 43.5% of cases showed no organism growth, while the present study had two out of three SSIs showing no organism growth, and one SSI showing Streptococcus species [25].

The Surgical Antimicrobial Prophylaxis (SAP) is exclusively aimed at preventing SSIs due to intraoperative wound inoculation and not infections that originate thereafter or in other locations. SAP should be administered and maintained at sufficiently high concentrations in serum, tissue, and the surgical site during the time that the incision is open, but only while the incision is open. No conclusive evidence was identified for the benefit of postoperative continuation of SAP versus discontinuation. When best infection prevention practices were followed, the postoperative continuation of SAP did not add any additional benefit in reducing SSIs. Increasing the duration of antibiotic prophylaxis was associated with a higher risk of acute kidney injury and Clostridium difficile infection but did not lead to a reduction in SSIs [26]. The same conclusion was drawn in the present study, i.e., a single preoperative dose 30-45 minutes before surgery is sufficient.

Limitation(s)

The biggest limitation was the loss to follow-up of a few patients during the second and third follow-ups, as well as the unaccountability of patients due to various reasons. Further multicentric randomised controlled studies with larger patient cohorts are needed for stronger evidence.

CONCLUSION(S)

There was no significant difference in the incidence of SSI in the groups receiving single and multiple preoperative doses of prophylactic antibiotics. However, the duration of hospital stay was significantly shorter in the group receiving a single dose of preoperative prophylactic antibiotics. Patients receiving a single prophylactic antibiotic dose could be discharged earlier, saving productive hours, income, and reducing the risk of nosocomial infections and associated costs. Additionally, the approach may contribute to the prevention of antibiotic resistance and allergic reactions associated with prolonged antibiotic use. Prolonged preoperative hospital stay for multiple doses of antibiotics has been associated with increased SSI incidence, and the practice of cost-effective short-term antibiotic prophylaxis is crucial. Hence, the present study concludes that for clean surgeries without co-morbidities, a single preoperative antibiotic dose is recommended with no or decreased SSI incidence.

REFERENCES

[1] Priya LR, Bhoyate AA, Lokesh S, Singh KG, Sharma KL. Surgical site infections–incidence, risk factors, and microbiological pattern–Study from North East India. IOSR-JDMS. 2018;17(1):23-28. Doi: 10.9790/0853-1701082328.
[2] Garg S, Garg S, Shoaib M. Efficacy of single dose versus multiple dose antibiotic prophylaxis in clean and clean-contaminated herniorrhaphy surgery. Journal of Evidence-Based Medicine and Healthcare. 2018;5(39):2786-89.
[3] National health care safety network, Surgical Site Infection (SSI) Event. January 2020; Center for Disease Control, Atlanta, US: pg.9-8-9-13. Available from: https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf.
[4] Perencevich EN, Sands KE, Cosgrove SE, Guadagnoli E, Meara E, Platt R. Health and economic impact of surgical site infections diagnosed after hospital discharge. Emerg Infect Dis. 2003;9(2):196-203.
[5] Magill SS, Edwards JR, Bamberg W, Beldavs ZG, Dumyati G, Kainer MA, et al. Emerging infections program healthcare-associated infections and antimicrobial use prevalence survey team. Multistate point-prevalence survey of health care-associated infections. N Engl J Med. 2014;370(13):1198-208.
[6] Pal DN. Surgical site infection in surgery ward at a tertiary care hospital: The infection rate and the bacteriological profile. IOSR J Pharm (IOSRPHR). 2012;2(5):01-05.
[7] O'Connell PR, McCaskie AW, Williams NS. Surgical infections. Bailey & Love's Short Practice of Surgery, 27th Edition. CRC Press; 2018.
[8] Whitehouse JD, Friedman ND, Kirkland KB, Richardson WJ, Sexton DJ. The impact of surgical-site infections following orthopaedic surgery at a community hospital and a university hospital adverse quality of life, excess length of stay, and extra cost. Infect Control Hosp Epidemiol. 2002;23(4):183-89. Doi: 10.1086/502033. PMID: 12002232.
[9] Martone WJ, Nichols RL. Recognition, prevention, surveillance, and management of surgical site infections: Introduction to the problem and symposium overview. Clin Infect Dis. 2001;33(Suppl 2):S67-68.
[10] Najjar PA, Smink DS. Prophylactic antibiotics and prevention of surgical site infections. Surg Clin North Am. 2015;95(2):269-83.
[11] Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: Attributable mortality, excess length of hospitalization, and extra costs. Infect Control Hosp Epidemiol. 1999;20(11):725-30. Doi: 10.1086/501572. PMID: 10580621.
[12] Mehta M. Proper use of surgical antibiotic prophylaxis for prevention of surgical site infections: Preoperative timing and duration of prophylaxis. Natl J Physiol Pharm Pharmacol. 2020;10(5):409-12.
[13] Remschmidt B, Schwaiger M, Gaessler J, Wallner J, Zemann W. Surgical site infections in orthognathic surgery: Prolonged versus single-dose antibiotic prophylaxis. Int J Oral Maxillofac Surg. 2023;52(2):219-26. Doi: 10.1016/j.ijom.2022.06.002. Epub 2022 Jun 25. PMID: 35760661.
[14] MacDougall C. Penicillins, cephalosporins, and other β-Lactam antibiotics. Brunton LL, Hilal-Dandan R, Knollmann BC. Goodman & Gilman's the pharmacological basis of therapeutics. 13th ed. New York: McGraw-Hill Education; 2017.
[15] Kudchadkar AA, Bhounsule SA. An observational study on the surgical antibiotic prophylaxis in the surgery ward of a tertiary care hospital. Int J Basic Clin Pharmacol. 2019;8(7):1647-51.
[16] Tripathi KD. Beta Lactam antibiotics. Essentials of Medical Pharmacology. 8th ed. New Delhi: Jaypee Brothers Medical Publishers; 2019:775-778.
[17] Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, et al; American Society of Health-System Pharmacists; Infectious Disease Society of America; Surgical Infection Society; Society for Healthcare Epidemiology of America. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2013;70(3):195-283. Doi: 10.2146/ajhp120568. PMID: 23327981.
[18] Treatment Guidelines for Antimicrobial Use in Common Syndromes. 2nd edition. 2019 New Delhi, India: 97-102. [Internet]. Available from: https://main.icmr.nic.in/sites/default/files/guidelines/Treatment_Guidelines_2019_Final.pdf.
[19] Townsend CM. Sabiston textbook of surgery: The biological basis of modern surgical practice. St. Louis, Missouri: Elsevier; 2022:225.
[20] Ahmed SO, Mahadi SI, Ahmed M. Antibiotic prophylaxis in clean and clean-contaminated surgery and surgical site infection in khartoum teaching hospital. Sudan Med J. 2015;51(3):24-32.
[21] Madhu BS, Kumar HBS, Reddy MNK, Reddy AV, Kalabhairav S. Effect of single-dose preoperative antibiotic prophylaxis versus conventional antibiotic therapy in patients undergoing Lichtenstein tension free mesh repair. International Surgery Journal. 2017;4(2):738-42.
[22] Das S, Kundu R, Chattopadhyay BP. Comparison of single-dose versus multiple doses of antibiotic prophylaxis for prevention of surgical site infection. International Surgery Journal. 2022;9(1):129-32.
[23] Bendre M, Kshirsagar V, Male P, Rathod S, Khandalkar S. Role of single dose antibiotic prophylaxis in clean general surgery. J Med Sci Clin Res. 2016;4(6):11021-26.
[24] Tamayo E, Gualis J, Flórez S, Castrodeza J, Eiros Bouza JM, Álvarez FJ. Comparative study of single-dose and 24-hour multiple-dose antibiotic prophylaxis for cardiac surgery. J Thorac Cardiovasc Surg. 2008;136(6):1522-27.
[25] Akhter MSJ, Verma R, Madhukar KP, Vaishampayan AR, Unadkat PC. Incidence of surgical site infection in postoperative patients at a tertiary care center in India. J Wound Care. 2016;25(4):210-17.
[26] Sartelli M, Boermeester MA, Cainzos M, Coccolini F, de Jonge SW, Rasa K, et al. Six long-standing questions about antibiotic prophylaxis in surgery. Antibiotics (Basel). 2023;12(5):908. Doi: 10.3390/antibiotics12050908. PMID: 37237811; PMCID: PMC10215114.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of General Surgery, Nijalingappa Medical College and Kumareshwara Hospital, Bagalkot, Karnataka, India.
2. Senior Resident, Department of General Surgery, Nijalingappa Medical College and Kumareshwara Hospital, Bagalkot, Karnataka, India.
3. Professor, Department of General Surgery, Nijalingappa Medical College and Kumareshwara Hospital, Bagalkot, Karnataka, India.
4. Professor, Department of General Surgery, Nijalingappa Medical College and Kumareshwara Hospital, Bagalkot, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. C Shobha,
MCh Doctors New Quarters, Navnagar, Government District Hospital, Navnagar, Bagalkot-587103, Karnataka, India.
E-mail: drshobhacnaik@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jan 06, 2024
- Manual Googling: Mar 27, 2024
- iThenticate Software: Apr 03, 2024 (19%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Jan 05, 2024**
Date of Peer Review: **Feb 17, 2024**
Date of Acceptance: **Apr 04, 2024**
Date of Publishing: **May 01, 2024**