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Evaluating the Competency of Dental Students and House Officers in Inferior Alveolar Nerve Block with Clinical Training Reinforcement

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ABSTRACT

Objective: This study aims to assess the competency of dental students and house officers in performing the inferior alveolar nerve block, focusing on the impact of reinforced clinical training.

Materials and Methods: A cross-sectional study was conducted using non-probability consecutive sampling. A total of 90 dental students and house officers were evaluated before and after clinical reinforcement to assess their proficiency in performing inferior alveolar nerve block (IANB). Data analysis was conducted using SPSS version 25.

Results: The results revealed a significant improvement in the participants' ability to correctly identify anatomical landmarks after clinical reinforcement, which contributed to more effective IANB administration.

Conclusion: Focused clinical reinforcement significantly enhances the competency of dental practitioners in performing the IANB, leading to improved outcomes for both practitioners and their patients.

Keywords: Anatomical landmarks, Clinical reinforcement, Inferior alveolar nerve block, Local anesthesia

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INTRODUCTION

The inferior alveolar nerve block (IANB) is one of the most widely used techniques in dentistry for anesthetising the lower jaw.[1] Dental students, house officers, general dentists, and postgraduates commonly perform this block for procedures such as lower tooth extractions, root canal treatments, and other procedures confined to the lower jaw. It is a cornerstone of pain-free dentistry, bridging the gap between the procedure and the patient's comfort. To perform an effective IANB, dentists must possess a solid understanding of the anatomical landmarks involved. The mandible exhibits considerable anatomical variability, making a detailed understanding crucial for successful anaesthesia.[2] Improper anaesthesia may lead to patient discomfort, failed procedures, and heightened stress for both patients and practitioners. Mastery of the IANB technique is an indicator of professional skill, building patient trust and enhancing overall clinical outcomes. A strong understanding of the inferior alveolar nerve, its landmarks, and variations allows dentists to provide effective, safe, and painless care. Successful execution of the IANB depends heavily on the clinician's ability to identify anatomical variations. Less experienced clinicians may struggle to adapt to altered landmarks, resulting in decreased success rates. The efficacy of IANB is known to improve with increased clinical experience.[3]

Clinical reinforcement strengthens medical education by combining theoretical knowledge with hands-on experience, thereby improving retention, critical thinking, and practical skills.[7,9] It enhances confidence, adaptability, and professionalism, preparing students for real-world challenges and improving patient care outcomes. Todashaki et al. found that dental students achieved a success rate of over 70%, while professors and postgraduate students in the Department of Oral and Maxillofacial Surgery showed a success rate of 90%, illustrating a significant difference in competency.[4] Similar research by Ghavimi et al. indicated success rates of 93.5% and 71% for IANB with and without panoramic radiographic guidance, respectively.[5] Mohamed et al. demonstrated that different teaching methods could improve IANB effectiveness among students.[6] Alhindi et al. reported a decrease in failure rates of IANB when both theoretical and hands-on practices were provided.[7] Furthermore, dental anxiety and other patient conditions can influence the success of the IANB.[8]

MATERIALS AND METHODS

A cross-sectional analytical study was conducted at the University College of Dentistry (UCD), The University of Lahore, with ethical approval from the UCD review board. SPSS version 25 was utilized for data analysis. Non-probability consecutive sampling was used, and a pre-validated questionnaire assessed the effectiveness of the IANB technique before and after clinical reinforcement. Medically fit adult patients requiring IANB for simple or complex extractions and root canal treatments were randomly assigned to dental students or house officers under supervision. A visual analogue scale (VAS) was used to assess the severity of pain during the procedure, ranging from 0 (no pain) to 10 (worst pain). Dental students from the first, second, and third years, as well as patients with neurological conditions, were excluded from the study.

Before clinical reinforcement, supervisors filled out a questionnaire evaluating the participants' skills. Clinical reinforcement focused on the correct identification of anatomical landmarks and the proper technique for administering IANB. Afterwards, participants were re-evaluated on the same criteria, showing a marked improvement in IANB effectiveness.

RESULTS

The responses of participants are summarized in figure 1 and figure 2. According to Figure 1, 16 house officers correctly identified the pterygomandibular raphe and coronoid notch before clinical reinforcement, which increased to 19 after reinforcement. Similarly, 14 house officers correctly identified the pterygomandibular space before reinforcement, which rose to 19 after clinical intervention. The mandibular ramus was identified by 16 house officers before reinforcement, increasing to 20 after clinical reinforcement.

Figure 2 presents data for final-year students, where 9 students identified the pterygomandibular raphe and coronoid notch initially, which doubled after clinical reinforcement. The pterygomandibular space was identified by 8 students before clinical intervention, increasing to 19 afterwards. The mandibular ramus was identified by 11 students, increasing to 18 after clinical reinforcement.

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Figure No 1: Identification Of Anatomical Landmarks(House Officers)

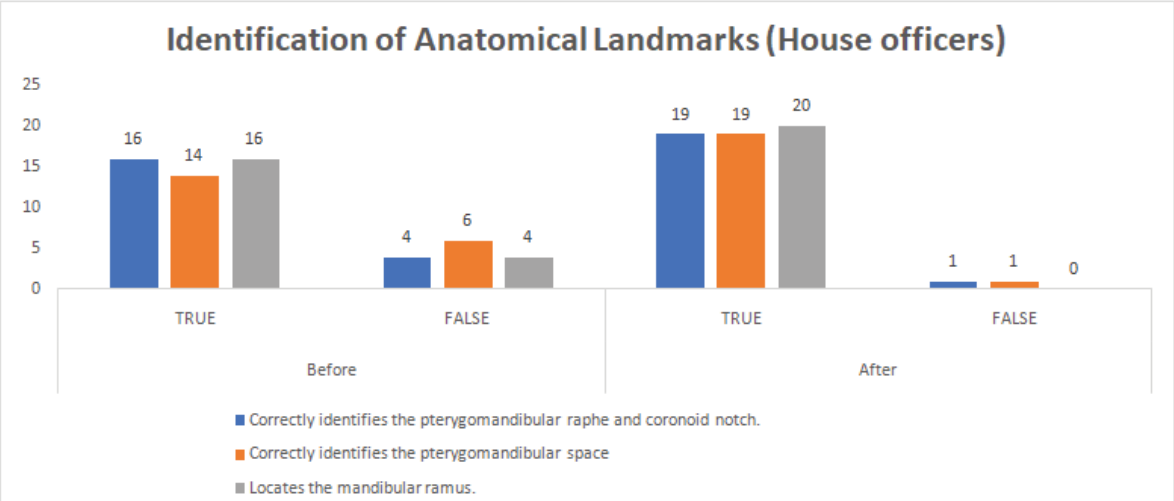
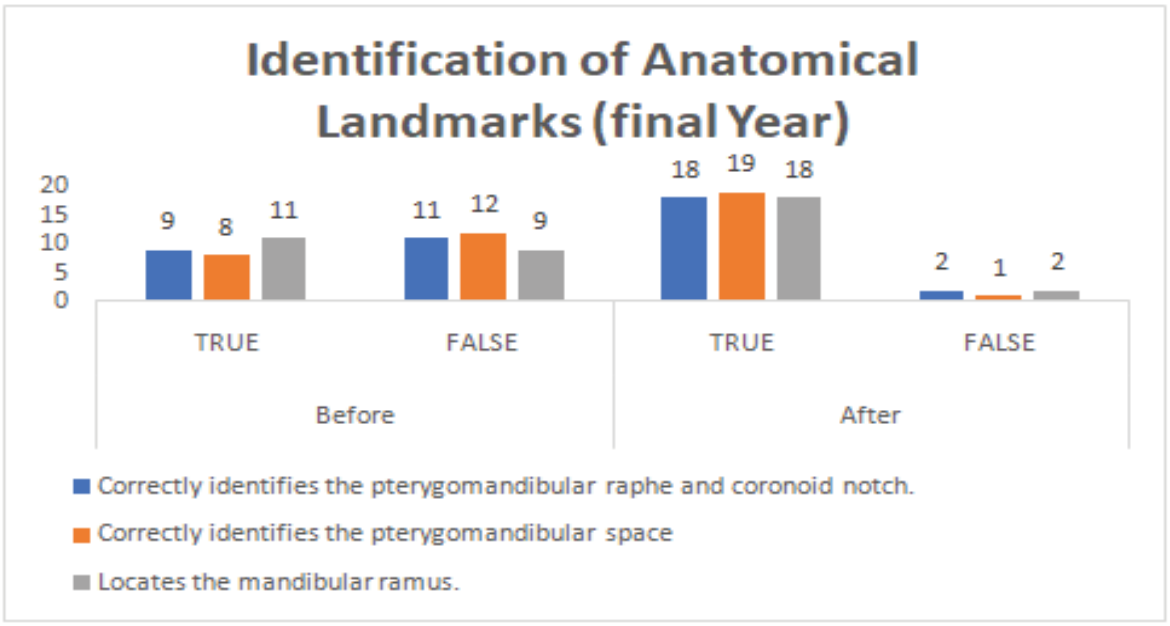


Figure No 1: Identification Of Anatomical Landmarks(Final Year)



DISCUSSION

In Pakistan, while most dental professionals are familiar with the IANB technique, there is often difficulty in correctly identifying the anatomical landmarks and the appropriate penetration sites.[9] In my opinion, theoretical knowledge and clinical knowledge are two different domains and are equally important to understand to get effective Inferior alveolar Nerve Block. However, anatomy varies from patient to patient but still knowledge and practice help achieve the results of IANB. Correct identification of anatomical landmarks is quite important in order to hit the exact penetration site and to avoid complications. IANB can cause serious complications if not accurately administered. Improper technique, incorrect identification of landmarks and needle misplacement can lead to trismus, hematoma, facial nerve paralysis, needle breakage and inadequate anaesthesia. Hence, both clinical and theoretical knowledge is important to achieve results. The IANB is not limited to tooth extractions but is also used for procedures such as root canal treatments, dental implants, periodontal surgeries, and biopsies. The primary aim of the IANB is to provide a pain-free environment for patients, contributing to better treatment outcomes.[10]

Unfortunately, many students and house officers possess strong theoretical knowledge of anatomical landmarks but struggle with their correct identification in clinical settings. To provide high-quality care and ensure patient

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comfort, practitioners must master the IANB technique. The struggle to achieve effective local anaesthesia can be enhanced by giving clinical reinforcement, and with practice, they can master it.

Ameerally et al. emphasised the need for better education systems to ensure that dental and medical practitioners have a comprehensive understanding of their specialty, ensuring the best outcomes for patients.[1] Both practical and theoretical knowledge play an important role in achieving the results of choice. If the practical training is carried out with focused reinforcement of the theoretical knowledge, then results could be achieved better the chances of failure will be reduced. Positive or negative reinforcement also play a role in the outcome. [11]

Todashaki et al. found that dental students had a success rate of over 70%, which increased to 90% among professors and postgraduate students, highlighting that both dental students and house officers increased to over 90% after clinical reinforcement.[12] It is hence proved that with the clinical exposure and reinforcement, the chances of failure of IANB are reduced. In the comparative study, the results were increased, showing that with experience, the chances of failure are reduced.

Ghavimi et al. reported success rates of 93.5% and 71% for IANB with and without panoramic radiography, respectively.[5] In contrast, our study showed an increase in success rates to over 90% without radiographic guidance. With radiographic guidelines, the participants get the clue of IANB, and the success rate is increased. In our study no radiographic guidelines were used, but the participants were assessed after giving clinical reinforcement. The results were increased immensely, and the complications and failures were reduced.

Mohamed et al. demonstrated that various teaching methods improve IANB effectiveness, which aligns with our findings that clinical intervention significantly enhanced the IANB competency of both house officers and dental students. The results show that after the clinical reinforcement, the chances of failure of IANB were reduced.[13,14]

Alhindi et al. showed that both theoretical education and hands-on training could reduce failure rates in IANB.[15] Our study produced similar results, emphasising that clinical reinforcement improves the success of the inferior alveolar nerve block. With the clinical reinforcement, the participants increased the efficiency of IANB and the less failures of IANB were experienced.

CONCLUSION

The competency of dental practitioners in performing the inferior alveolar nerve block can be substantially improved through focused clinical reinforcement, ultimately leading to better clinical outcomes for both practitioners and patients.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

None whatsoever

FUNDING DISCLOSURE

None

ETHICAL APPROVAL

Ethical approval was provided by IRB at University college of Dentistry, University of Lahore Ref: UCD/ERCA/24/483.

AUTHORS CONTRIBUTION

Conception and design of the study: A. Ahmad, A. Liaquat, M. Rasheed, M. U. H. Haider, K. Azam
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Critical review of the manuscript: A. Ahmad, A. Liaquat, R. Naseer, M. Rasheed, M. U. H. Haider, K. Azam
Approval of the final version of the manuscript to be published: A. Ahmad, A. Liaquat, R. Naseer, M. Rasheed, M. U. H. Haider, K. Azam

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Tables should supplement, not duplicate, the text. They should have a concise table heading, be self-explanatory, and be numbered consecutively in the order of their citation in the text. Items requiring explanatory footnotes should be denoted using superscripted lowercase letters (a, b, c, etc.), with the footnotes arranged under the table in alphabetical order. Asterisks (*, **) are used only to indicate the probability level of tests of significance. Abbreviations used in the table must be defined and placed after the footnotes in alphabetical order. If you include a block of data or table from another source, whether published or unpublished, you must acknowledge the source by adding a credit line as the first footnote beneath each table. This credit line should be a complete bibliographical listing of the source publication (as a reference), or other credit lines as supplied by the copyright holder. For example, "Reprinted with permission from Calfee DR, Wispelwey B. Brain abscess. Semin Neurol 2000;20:357." ("Data from . . ." or "Adapted from . . ." may also be used, as appropriate.)

Do not intersperse tables in the text. Tables should appear before the figure legends. Insert a page break between the end of the table and the start of the figure legends. If a table contains artwork, supply the artwork separately as a digital file.

L. Figures

General guidelines

The number of figures should be restricted to the minimum necessary to support the textual material. Figures should have an informative figure legend and be numbered in the order of their citation in the text. All symbols and abbreviations should be defined in the figure legend in alphabetical order. Items requiring explanatory footnotes should follow the same style as that for tables as described in Section "Tables". It is best to use Adobe Photoshop to create and save images, and Adobe Illustrator for line art and labels. Do not submit art created in Microsoft Excel, Word, or PowerPoint. These files cannot be used by the typesetter.

Unless you have written permission from the patient (or, where applicable, the next of kin), the personal details (such as their name, date of birth, hospital or social security numbers, or other personal or identifying information) of the patient must be removed. If their face is shown, use a black bar to cover their eyes so that they cannot be identified.

All lettering should be done professionally and should be in proportion to the drawing, graph, or photograph. Photomicrographs must include an internal scale marker, and the legend should state the type of specimen, original magnification, and stain.

Figures must be submitted as separate picture files at the correct resolution. The files should be named according to the figure number, e.g., "Fig1.tif", "Fig2.jpg".

Images of patients or research subjects should not be used unless the information is essential for scientific purposes and explicit permission has been given as part of the consent. Even where consent has been given, identifying details should be omitted if they are not essential.

If identifying characteristics are altered to protect anonymity, authors should provide assurances that such alterations do not distort scientific meaning.

Formats

Regardless of the application used, when your electronic artwork is finalized, please "save as" or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):

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TIFF: Colour or grayscale photographs (halftones) — always use a minimum of 300 dpi (dots per inch).

TIFF: Bitmapped line drawings — use a minimum of 1000 dpi.

TIFF: Combination of bitmapped line/halftone (colour or grayscale) — a minimum of 600 dpi.

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Please do not: Supply files that do not meet the resolution requirements detailed above; Supply files that are optimized for screen use (such as GIF, BMP, PICT, WPG) as the resolution is too low; Submit graphics that are disproportionately large for the content.

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consistent with what is used in the text. Avoid using multiple fonts and font sizes for the labels; use only one or two sizes of a serif font.

M. Acknowledgments

After the conclusion section, general acknowledgements for consultations and statistical analyses should be listed concisely, including the names of the individuals who were directly involved. Consent should be obtained from those individuals before their names are listed in this section. Those acknowledged should not include secretarial, clerical, or technical staff whose participation was limited to the performance of their normal duties.

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It is required that a list of disclosures from every named author is submitted alongside the manuscript. In it, each author should identify any financial or non-financial conflicts relevant to the article. If no conflicts exist, please state so in this section. Please see our editorial policy on conflicts of interest available on the Journals website.

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