

INCIDENCE OF HEMATOMA FOLLOWING POSTERIOR SUPERIOR ALVEOLAR NERVE BLOCK ADMINISTRATION AMONG UNDERGRADUATE STUDENTS

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ABSTRACT:

Introduction: PSANB (Posterior Superior Alveolar Nerve Block) is a procedure used in dentistry to achieve anaesthesia before performing any surgical or non-surgical treatment on the buccal surface of maxillary molars and their adjacent tissues. Hematoma is considered a complication during administration of Local anesthesia. Hematomas develop when the needle unintentionally nicks the vessels (artery or vein) in its vicinity while administering anaesthetic, resulting in blood filling the extravascular spaces. The aim of the study is to determine the incidence of Hematoma formation following the administration of PSA nerve block among Undergraduate students.

Materials and Method: This was a university dental hospital based prospective, cross sectional study conducted among UG clinicians attending a University dental hospital in Chennai. The study population was around 300 UG Clinicians. The number of PSA nerve blocks administered by each student was collected, along with the number of hematoma development due to the PSA nerve block. The population was divided based on their Year of study. The results were tabulated and analysed using SPSS software version 23.0. Descriptive statistics and relation between variables was determined using the chi-square test, where $p < 0.05$ was considered statistically significant.

Results: 1089 PSA nerve blocks had been administered by the UG Clinicians over 2 years. 30.8% of the total was administered by Third years, 42.9% was administered by Final years and 26.1% was administered by the Interns. Overall, almost 8.5% of the PSA nerve blocks administered by Undergraduates developed hematomas. The cross tabulation between Year of study and the development of hematomas was found to be statistically significant.

Discussion: In the current study, we observe a decrease in the development of hematoma as the number of years of clinical exposure increases. This can be attributed to better anatomical understanding by the clinician due to experience, proper usage of long needles and aspiration. It is important to understand the emergency management of hematoma, should it occur. Ice packs to reduce immediate swelling and antibiotic prophylaxis should be administered to the patient to prevent any acute infections. It should be mentioned that while hematomas subside within 10-15 days, the unattractive appearance of the hematoma on the side of the face has a significant psychological impact on the patient's well-being and creates an embarrassing predicament for the dentist.

Conclusion: It can thus be concluded that the current study shows a significant decrease in hematoma development by Undergraduate Interns when compared to Third year undergraduate students. The incidence of hematoma decreases with increase in experience.

Key words: Hematoma, Posterior Superior Alveolar Nerve block, Local anesthesia, Innovative technique.

INTRODUCTION:

PSANB (Posterior Superior Alveolar Nerve Block) is a maxillary anesthesia technique used in dentistry to achieve local anaesthesia before performing any surgical treatment on the maxillary molars and their adjacent buccal tissues(1). The Posterior Superior Alveolar (PSA) nerve is a major sensory branch of the maxillary division of the trigeminal nerve that supplies the buccal gingiva, periodontium, and alveoli related to upper molar teeth, as well as pulpal innervations of all maxillary molar teeth except the mesiobuccal root of the first molar, which is additionally supplied by the infraorbital nerve in 28% cases(2). Complications such as hematoma formation, blurred vision, and temporary visual defects are common despite the care taken during the administration of the PSA block(3). Hematoma is considered a complication during administration of Local anesthesia. Hematomas develop when the needle unintentionally nicks the vessels (artery or vein) in its vicinity while administering anaesthetic, resulting in blood filling the extravascular spaces. Although a venous puncture by needle may not result in the creation of a hematoma that can be seen, the extent of a hematoma seen after an arterial perforation can be seen clinically and quickly due to the significantly higher blood pressure within the artery(4). The size of the hematoma usually depends on the density of the surrounding tissues. A temporary unaesthetic hematoma in the lower buccal tissue region of the jaw may result from a blood vessel injury caused by the needle penetrating too far distally during Posterior superior alveolar nerve block(5). When a blood vessel associated with this

nerve is injured, blood is ejected into the infratemporal fossa, which can hold a large volume of blood, from which it travels inferiorly and anteriorly to the lower region of the cheek, causing swelling and discoloration(6). This happens within minutes of the administration of LA. Since the affected blood vessels lie posterior, superior, and medial to the maxillary tuberosity, applying pressure to the bleeding site is difficult. When the external pressure on the blood vessels overcomes the internal pressure or clotting occurs, bleeding usually ceases. Patients with haematological diseases or conditions may be more susceptible to hematoma development(7).

Swelling and discoloration in the affected area normally goes away in 10–15 days. Soreness and trismus are possible side effects for the patient. The patient should be instructed to take analgesics and to avoid using heat to reduce the size of the hematoma owing to vasodilation in the immediate aftermath(28). Applying ice to the hematoma as soon as it develops helps to reduce the size by vasoconstriction and also has a palliative effect. For the first 24 hours after surgery, the patient should apply ice packs 30 minutes every hour, followed by intermittent hot moist packs to resolve the condition. Any dental treatment in the affected area should be postponed until the symptoms and signs have subsided. Hematomas put strain on tissues and wounds, reduce vascularity, and raise tension on the wound's borders, as well as acting as culture media, which can speed up the development of a wound infection. If the hematoma is extensive, antibiotic medication should be provided(29). Our team has extensive knowledge and research experience that has translate into high quality publications(8-27)

To avoid the formation of a hematoma during any nerve block, it is critical to have a detailed understanding of the typical anatomy of the affected area. The injection technique can be adjusted based on the anatomy of the patient. The posterior superior nerve block has the highest risk of hematoma formation, followed by the inferior alveolar nerve and mental/incisive nerve blocks. To reduce the chance of hematoma formation, the clinician should try using a short needle with a low number of needle penetrations into tissues(30).

The aim of the study is to determine the incidence of Hematoma formation following the administration of PSA nerve block among Undergraduate students.

MATERIALS AND METHOD:

Study setting

This was a university dental hospital based prospective, cross sectional study conducted among UG clinicians attending a University dental hospital in Chennai.

Sampling

The study population was around 300 UG Clinicians. The number of PSA nerve blocks administered by each student was collected, along with the number of hematoma development due to the PSA nerve block. The population was divided based on their Year of study- Third Year UGs, Final Year UGs and UG Interns.

Data Analysis:

Microsoft Excel was used for tabulation of the parameters and then the data was exported to theSPSS software version 23.0. Descriptive statistics and relation between variables was determined using the chi-square test, where $p < 0.05$ was considered statistically significant.

Ethics:

The Institutional Review Board evaluated and authorized the study.

RESULTS

From the data collected, the tabulations indicated that almost 1089 PSA nerve blocks had been administered by the UG Clinicians over 2 years. 30.8% of the total was administered by Third years, 42.9% was administered by Final years and 26.1% was administered by the Interns [Fig. 1]. Among the third years, 11.6% of the PSA nerve blocks had developed hematomas[Fig. 2], and among the final years, almost 8% of the PSA nerve blocks had developed hematomas [Fig. 3]. 6% of the PSA nerve blocks administered by the Interns gave rise to hematomas[Fig. 4]. Overall, almost 8.5% of the PSA nerve blocks administered by Undergraduates developed hematomas [Fig. 5]. The crosstabulation between Year of study and the development of hematomas was found to be statistically significant [Fig. 6].

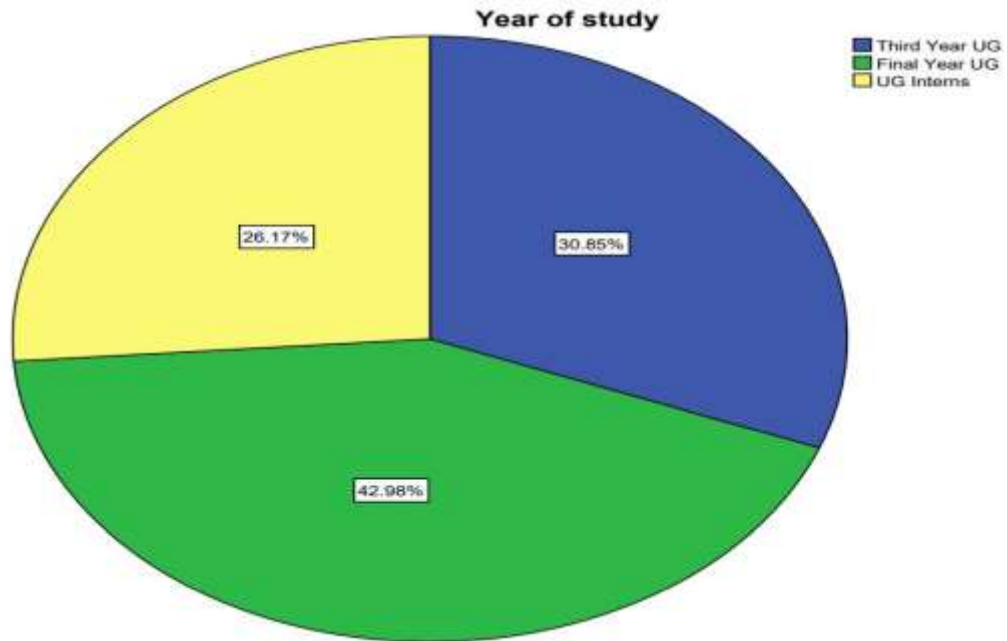


Fig. 1: Pie chart depicting the Year of study of the UG students who administered PSA nerve block in 2 years. 30.85% were by Third year students [Blue], 42.9% were by Final year students [Green] and 26.1% were by UG Interns [Yellow].

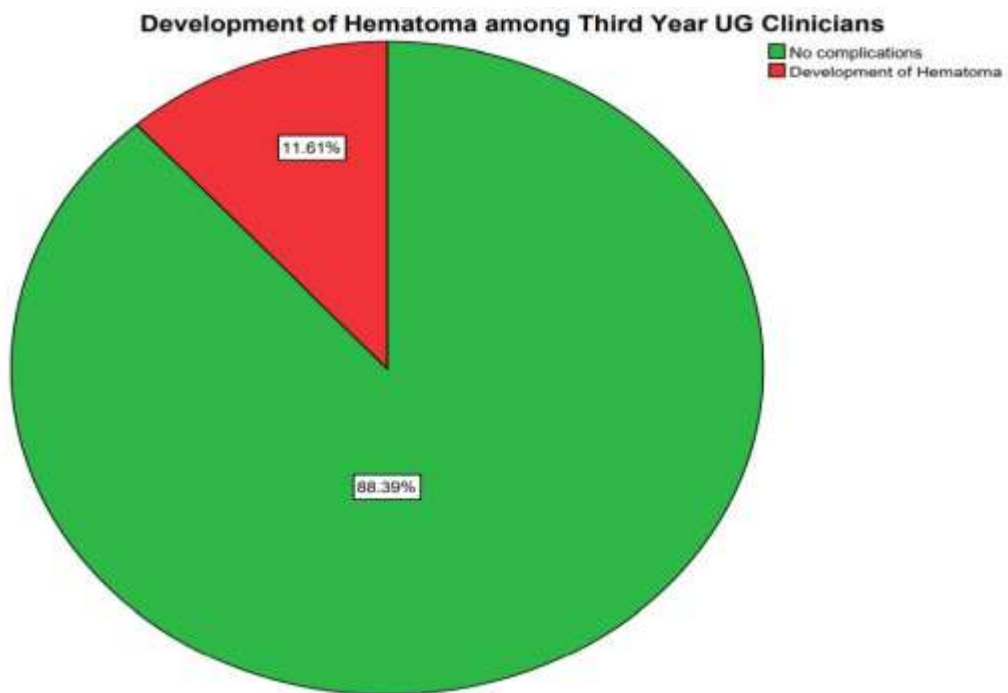


Fig. 2: Pie chart depicting the development of hematomas in PSA nerve blocks administered by Third year UG students. 11.61% of the blocks developed hematomas [Red], while 88.39% of the blocks developed no complications [Green].

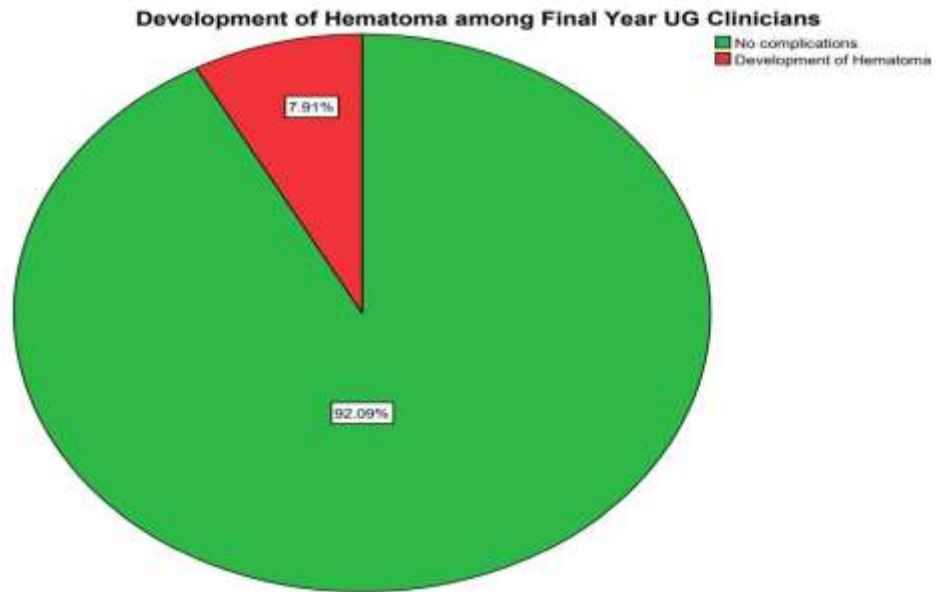


Fig. 3: Pie chart depicting the development of hematomas in PSA nerve blocks administered by Final year UG students. 7.91% of the blocks developed hematomas [Red], while 92.09% of the blocks developed no complications [Green].

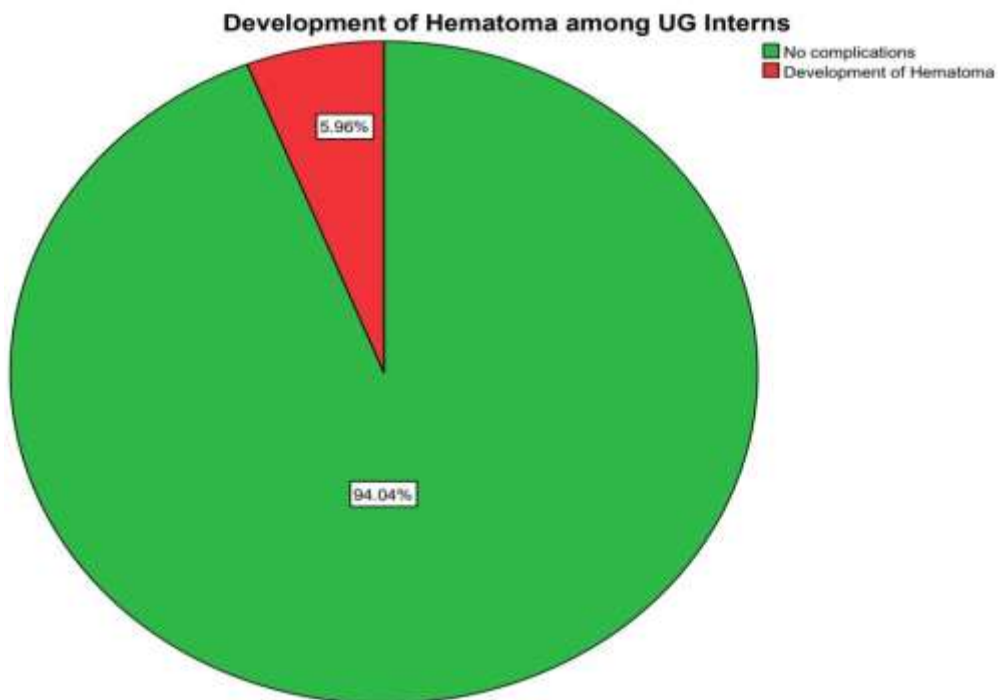


Fig. 4: Pie chart depicting the development of hematomas in PSA nerve blocks administered by UG Interns. 5.96% of the blocks developed hematomas [Red], while 94.04% of the blocks developed no complications [Green].

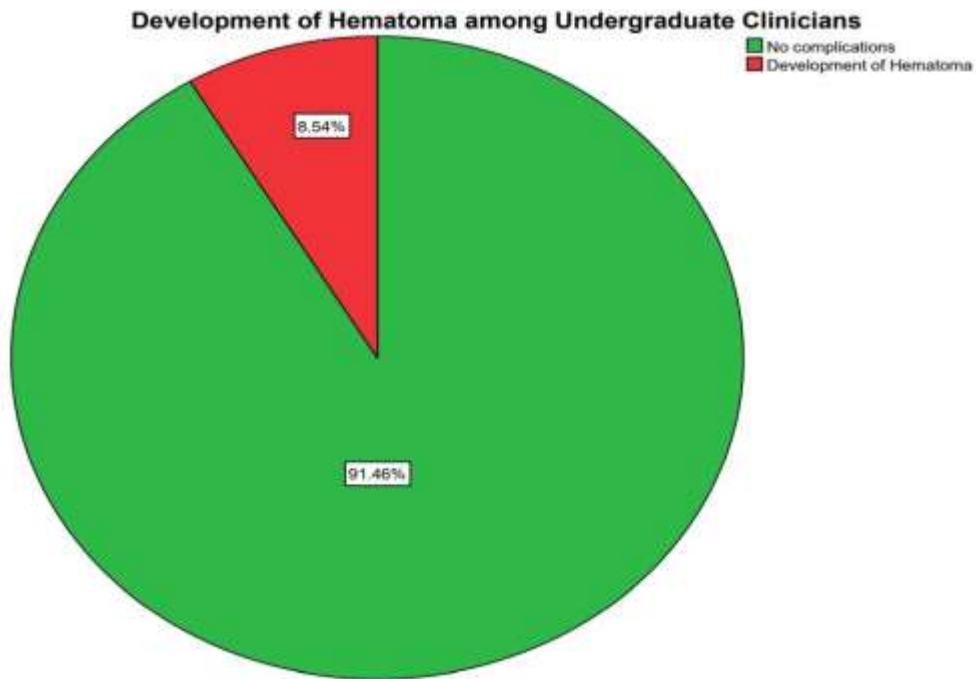


Fig. 5: Pie chart depicting the development of hematomas in PSA nerve blocks administered by Undergraduate students. 8.54% of the blocks developed hematomas [Red], while 91.46% of the blocks developed no complications [Green].

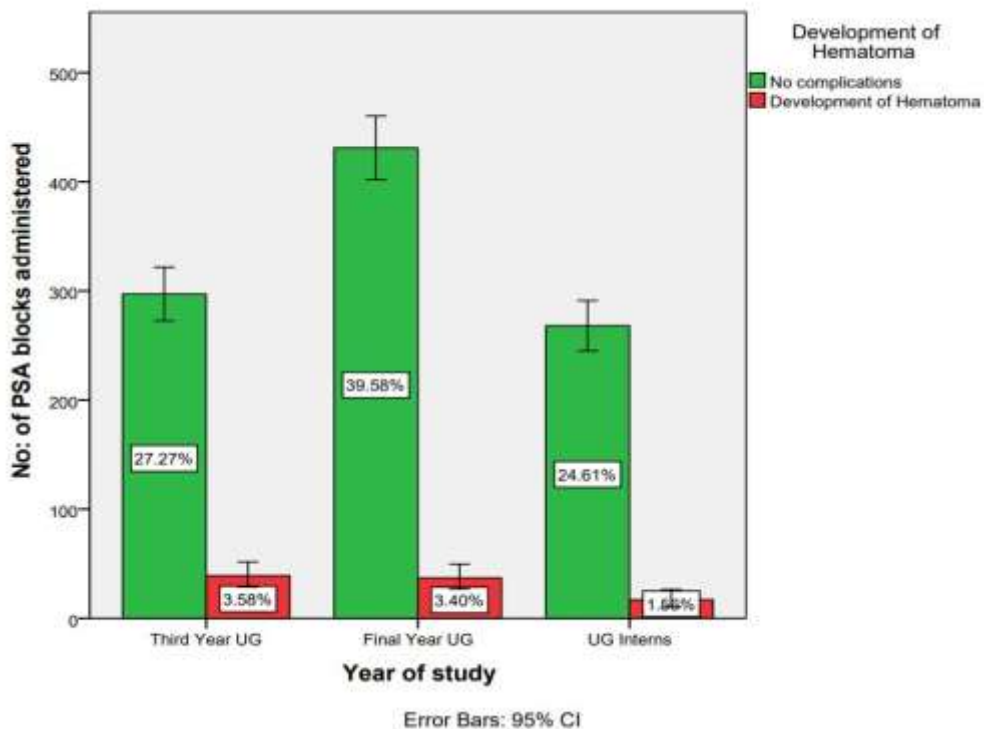


Fig. 6: Bar chart depicting the association between Year of study and the Development of hematoma following PSA nerve block administration. X axis denotes Year of study and Y axis denotes the Number of PSA blocks administered. Chi square test was done and it was not found to be statistically significant (Pearson Chi square= 6.707, df= 2, p value= 0.035 <0.05). More hematomas were developed when administered by Third year students, when compared to Final year students and Interns.

DISCUSSION

The Posterior Superior Alveolar Nerve block and the Inferior Alveolar Nerve block are most commonly associated with positive aspiration. Although the PSA is a highly successful technique, it needs to be weighed carefully as the risk of aspiration, hematoma and haemorrhage are quite high(31).

One of the most common reasons for hematoma formation is over insertion of needles. PSA nerve block is associated with 3.1% positive aspiration rate. A 27 Gauge needle is preferred for administration and if the needle is too short or long, the clinician runs a risk of over insertion of the needle. In an average adult, normal depth of penetration is 16 mm. The goal is to deposit LA close to the PSA nerves that are located posterosuperior and medial to the maxillary tuberosity(32). The second common cause of hematoma in PSA nerve block is failure to aspirate in two planes. Usually, failure to aspirate might not indicate the position of the needle with respect to the maxillary artery and the pterygoid venous plexus. Usage of a short needle is commonly associated with Pterygoid venous puncture. Intraoral hematomas usually occur in the buccal tissue of the mandibular region(30).

In the current study, we observed a decrease in the development of hematoma as the number of years of clinical exposure increases. This can be attributed to better anatomical understanding by the clinician due to experience, proper usage of long needles and aspiration. The size of a hematoma is determined by the density and compactness of the affected tissue, and the hematoma stops spreading when the pressures in the tissue and the vessel equalise.

Previous studies conducted by Thangavelu et al have shown that PSA nerve block, when administered using a curved 25 mm needle, has given 100% anesthesia of the region with zero recorded hematoma formation, both extraoral and intraoral(33).

A case report described by Biocic et al reported about a Hematoma formation in an 8 year old boy, with negative aspirations on both planes. Thus, it can be understood that it is impossible to completely avoid complications while using local anaesthetics. However, choosing the right local anaesthetic and using the right method can help to reduce their occurrence(34).

It is important to understand the emergency management of hematoma, should it occur. Ice packs to reduce immediate swelling and antibiotic prophylaxis should be administered to the patient to prevent any acute infections. It should be mentioned that while hematomas subside within 10-15 days, the unattractive appearance of the hematoma on the side of the face has a significant psychological impact on the patient's well-being and creates an embarrassing predicament for the dentist(35).

CONCLUSION:

It can thus be concluded that the current study shows a significant decrease in hematoma development by Undergraduate Interns when compared to Third year undergraduate students. This can be attributed to increase in skill and experience, along with better understanding of the anatomy and biplanar aspiration. The incidence of hematoma decreases with increase in experience.

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AUTHOR CONTRIBUTIONS:

Samyuktha P S contributed to data collection, analysis and interpretation and drafting of the article. Rubin S John contributed to the manuscript writing, guiding the study and critical revision of the manuscript.

CONFLICT OF INTEREST:

No potential conflict of interest relevant to this article was reported.

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