ABSTRACT:
Background: The blood aspiration technique before the injection of local anesthetic solution is an essential procedure, because it prevents possible systemic complications. The purpose of this study is to evaluate the incidence of intravascular injection in different techniques of inferior alveolar nerve block and to know the technique which has very low incidence of vascular penetration.
Methods: Fifty patients in the ages of 17-70 years irrespective of sex, who were indicated for bilateral extractions of mandibular teeth were selected for this study. Patients were randomly divided into two divisions consisting of 25 patients requiring bilateral extraction procedures. In first division classical technique of inferior alveolar nerve block was administered on one side and on 2nd appointment Angelo Sargenti technique was administered on the other side. In the second division of 25 patients, indirect technique was administered on one side in 1st appointment and Clark and Holmes technique was administered on the other side in next appointment. Incidence of positive aspiration due to inadvertent penetration of inferior alveolar vessels was recorded.

RESULTS: In group I positive aspiration rate was 8%, group II it was 4%, group III it was 4% and group IV it was 8%. Chi -square and fisher exact test was used and statistically there was no significant difference in the incidence of positive aspiration in all four groups. We found an overall aspiration rate of 6% in all four groups.

Conclusion: The incidence of positive aspiration was evaluated in all the 4 groups. There was no statistical significance in the rate of positive aspiration in all the groups included in our study.

Keywords: Inferior alveolar nerve block; positive aspiration; local anesthetics.

INTRODUCTION: Dentistry owes its very beginnings to the quest for pain relief. The identification, diagnosis and early elimination of pain remain as an important foundation to the dental profession. A painless surgical procedure is of prime importance to the ultimate success of surgery. The side effects from modern local anesthetic solutions are fortunately very rare. Given that, slow injection, correct concentration, appropriate dosage and selection of the appropriate agent, the chief cause of side effects is the inadvertent introduction of the solution into the general circulation due to penetration of a blood vessel by the needle. In these circumstances, adverse effects ensure more rapidly and are more severe than otherwise, and the importance of aspiration in order to prevent this complication should need no emphasis.

The prevention of intravascular injection of local anesthetic solution during the administration of infiltration and block injections for dental purposes has been recommended for many years. This can best achieved by aspirating before and during each injection. Aspiration depends upon both the diligence of the operator and the reliability of the syringe system.

It was found that high incidence of intravascular injection during inferior alveolar nerve block makes aspiration necessity.
The failure of anesthesia is mostly accompanied by an increased likelihood of serious systemic complications which may even endanger the life of the patient.

MATERIALS AND METHODS:
A total of 50 patients in the ages of 17-70 years irrespective of sex, who were indicated for bilateral extractions of mandibular teeth were selected for this study. Study was done on an outpatient basis in the Department of Oral and Maxillofacial Surgery, College of Dental Sciences, Davangere.

Inclusion criteria:
- Tooth/teeth indicated for extraction in the mandibular arch of patient aged between 17-70 years.
- Pre-structured proforma was used to collect the data of each patient which include case history, clinical examination, and investigations.

2% lignocaine with adrenaline was used as standard local anesthetic agent containing 1:80,000 adrenaline. Disposable 5ml syringe with 26 gauge thick and 1½ inch long needle was used in all cases.

Patients were randomly divided into 2 divisions consisting of 25 patients requiring bilateral exodontia procedures. In first division classical technique of inferior alveolar nerve block was administered on one side when patient reported to the first appointment.

When same patient reported for second appointment Angelo Sargenti technique of inferior alveolar nerve block was administered on the other side.

In the second division of 25 patients requiring bilateral exodontia procedures, indirect technique was administered on one side in first appointment and Clark and Holmes technique was administered on the other side in next appointment.

Incidence of positive blood aspiration due to inadvertent penetration of inferior alveolar vessels was recorded. Results were tabulated. Evaluation and comparison of positive blood aspiration among the techniques was done by using chi-square test and Fisher's exact test.

RESULTS: A total of 50 patients in the ages of 17-70 years irrespective of sex, who were indicated for bilateral extractions of mandibular teeth were selected for this study.

Study was done on an outpatient basis in the Department of Oral and Maxillofacial Surgery, College of Dental Sciences, Davangere.

Parameters included were age, sex, incidence of inadvertent vascular penetration of inferior alveolar nerve block using direct technique, Angelo Sargenti indirect technique and Clark and Holmes.

In group I there were 11 males and 14 females, in group II 11 males and 14 females, in group III 12 males and 13 females and group IV 12 males and 13 females. There was no statistical difference of males and females in all the four groups (Table 1). Age range was 17-70 years in all four groups. Statistically there was no significant difference in all four groups (Table 2).

In group I positive aspiration rate was 8%, group II it was 4%, group III it was 4% and group IV it was 8%. Statistically there was no significant difference in the incidence of positive aspiration in all four groups. We found an overall aspiration rate of 6% in all four groups (Table 3). Patients were divided into two age groups, one category below 30 years of age and the other category above 30 years of age. In patient below 30 years of age group, positive aspiration rate (20% was found in group I, 20% in group II, 12.5% in group III and 20% in group IV. Patient aged above 3 years positive aspiration rate of 5% was found in group I, 5% in group IV and no aspiration in group II or group III. Statistically there was no difference in terms of age and incidence of aspiration.

DISCUSSION:
The blood aspiration technique before the injection of the local anesthetic solution is an essential procedure because it prevents possible systemic complication resulting from the intravascular injection and local anesthetics. According to Malamed, nerve block of the inferior alveolar nerve is the technique with the greatest risk of accidental intravascular injection, with estimated incidence of 10% to 15%. The percentage of blood aspiration reported in the literature is highly variable. By definition, true blood aspiration occurs when a stream of blood rises through the cartridge with sufficient strength to mix with the anesthetic solution. In such situations the clinician must withdraw the needle, replace the cartridge and repeat the anesthetic technique from the start.
F. Frangiskas et al studied the incidence of penetration of blood vessels during inferior alveolar nerve block. They studied inferior alveolar nerve block in 250 patients at the clinic of oral surgery and anesthesiology at the Dental School, University of Athens. A Luer syringe with a 22G needle 32 mm long was used.

Positive aspiration is seen in 49 patients (20%) and they also concluded that between the ages of 9 to 19 the incidence of intravascular penetration was significantly greater than at other ages.\(^3\)

J.G. Meechan and G.S. Blair studied inferior alveolar nerve block and lingual block injection in 440 patients. A classical technique was used in this study. The incidence of positive aspiration was highest with inferior dental block injections (13.6%), than lingual blocks.\(^5\)

The overall incidence of positive aspirates in this study was higher than in most reported investigations into aspiration during mandibular anesthesia. Harris\(^6\) (3.6%), Forest\(^7\) (4.2%), Bos et al\(^8\), Cowan\(^9\), Persson\(^10\) (8.2%), and Williams and Simm\(^11\) all reported that < 10% of inferior alveolar nerve block injections produced positive aspiration.

Barlett has recorded the incidence of positive aspiration in 3,727 injections of these 944 were mandibular blocks of which 110 (11.7%) were positive and 189 were posterior region infiltrations of which 18 (3.1%) were positive. The overall rate of positive aspirations was 3.8%. He compares this with the results of Schiano and Strambi whose overall rate was 4.0% and of Harris overall rate of 3.2%.\(^12\)

In our study we found overall aspiration rate was 6% in all four techniques. That is 8% in group I, 4% in group II, 4% in group III and 8% in group IV. Statistically there was no significant difference in all the groups wherein different techniques were used in terms of positive aspiration.

Cowan did a study on new aspirating syringe. The new type of aspirating syringe is described in which the elastic recoil of a diaphragm in the anesthetic cartridge allows the procedure to be a passive rather than an active one. He did a study on 200 mandibular and tuberosity injections and found plunger and aspiration action is smooth, efficient and most comfortable to use.\(^9\)

In the Department of Oral and Maxillofacial Surgery, College of Dental Sciences, Davangere.

Meechan and Blair did a study on clinical experience in oral surgery with 2 different automatic aspirating syringes. The efficacy of 2 designs of automatic aspirating syringe was investigated in 440 patients receiving regional block anesthesia in the mandible.

Two automatic aspirating syringe systems were used in this investigations; the Astra self aspirating system and the rotor syringe. They observed more positive aspiration during inferior dental blocks with the rotor syringe compared to the Astra.\(^5\)

Molina et al conducted a study on different syringes in positive aspiration during inferior alveolar nerve block. He did a study by using 3 syringe systems that is non-self-aspirating (Uniject K) and 2 self-aspirating (Aspiject and Inibsaject). Significant differences (P<0.5) were observed with respect to hematic aspiration and the syringe system used, the UNIJECT K system yielding higher percentage hematic aspirations (5.69%) than either of the self aspirating systems, Inibsaject (2.03%) and Aspiject (1.2%) and they concluded that Uniject K non-self aspirating syringe system was associated with a higher number of hematic aspirations than the self aspirating system.\(^13\)

In our study we used non Luer Lok disposable plastic syringe (Dispovan) in all the four groups. The overall aspiration rate was 6%.

A study by Molina et al compared different syringes in positive aspiration during inferior alveolar nerve block. They used 2 types of needle in terms of gauge of the needle. The gauges were 30 gauge and 27gauge for conventional and surgical extraction of lower third molars. This study shows no statistical difference with respect to gauge of the needle.\(^15\)

According to Molina, needle gauge had no effect on the number of haematic aspirations recorded, in accordance with the observations of Watson and Colman\(^14\) in rabbit blood vessels and with the in vitro studies of Cooley and Robison\(^5\), in which 25G and 27G needles were compared.

Cohen et al reported positive aspirations to be significantly more frequent with 25G needles than with 27G needles, though blood aspirations was also seen to occur with the smaller bore needles.
Meechan JG and Blair GS, did their study on 440 patients using inferior alveolar nerve block. The incidence of positive aspiration using two different automatic aspirating syringes had 4 cases of adverse effects. They were a case of nausea, a case of syncope and two cases of palpitation or tachycardia.

In our study we did not encounter any complications while giving inferior alveolar nerve block in all four techniques.

CONCLUSION:
The prevention of intravascular injection of local anesthetic solution during the administration of block injections for dental purposes has been recommended for many years. This can be best achieved by aspirating before and during each injection. Aspiration depends upon both a thorough knowledge of oral anatomy and the diligence of the operator. To conclude, in our study there was no significant differences in rate of positive aspiration when four different techniques were employed to block inferior alveolar nerve.

Piesold did a study on aspirating reliability of different types of injection syringes with regard to the formation of punch cylinders. The results showed that false negative aspirations are caused by using a cannula that is too small (< 27 gauge) and they do not recommend injection cannulas with diameters of 27G or less (0.4mm).

In our study we used a needle gauge of 26G and the total aspiration was 6% in all the four techniques.

In the group I the aspiration rate was 8%, in group II 4%, in group III it was 4% and group IV it was 8%.

F. Frangiskos et al studied incidence of penetration of a blood vessel during inferior alveolar nerve block. A Luer syringe with a 22G needle 32mm long was used, in 250 patients. In 20% it showed that the tip of the needle was in a blood vessel.

Molina et al conducted a comparative study of different syringes in positive aspiration during inferior alveolar nerve block. They performed 246 inferior alveolar nerve blocks using 3 types of needle in terms of length and gauge combination. They were 30 gauge / 25mm, 27 gauge / 25mm and 27G / 35mm for conventional and surgical extraction of lower third molars. They concluded that, detection of haematic aspirations was not dependent on length or gauge of the needles used.

In our study we used needle length of 35mm in all the four groups. The overall aspiration rate was 6%.

A study was done by Bishop P.T on frequency of accidental intravascular injection of local anesthetics in children. This study includes children between age group of 7 to 16 years. Astra self-aspirating syringe and 27 gauge long needles were used. They were injected 2% solution of lignocaine with 1:80,000 adrenaline. Among the 642 inferior dental blocks 99 of them were positive. This gives a figure of 15.4% positive overall. In 7-12 year junior school age group 275 injections were given of which 55 were positive (20%), while only 10% in the 15 to 16 year age group were positive.

In our study only adult patients were included age range of 17-70 years. Positive aspiration was seen in 6 patients out of 100. Mean age 42.5 ± 16.0 we divided the patients into one group below 30 year and one group above 30 years. In patients below 30 years of age group we found positive aspiration rate of 20% in Group I, 20% in Group II, 12.5% in Group III and 20% in Group IV. Patients aged above 30 years we found positive aspiration of 5% in Group I, 5% in Group II and no aspiration in Group III and Group IV. Statistically there was no difference between age group in terms of aspiration.

Blair et al, in their study they find that the incidence of positive aspiration was significantly greater during inferior dental block administration in females compared to males (16.8% and 9.4% respectively) and can offer no explanation for this finding.

Kaster and Adin RD, in their investigation on positive aspirating syringe, reported sex difference in aspiration rates. They noted that in children, positive aspiration was more than twice as likely during injections in females compared to males.

In our study there was a positive aspiration of 4% in females and 2% in males in all the four groups. There was no statistical difference in terms of sex in relation to positive aspiration.

According to Malmed SF, the complications of an intravascular injection from inferior alveolar nerve block is over dosage, which can manifest as tiaaktiveness apprehension, sweating, elevated blood pressure elevated heart rate and elevated respiratory rate.

Meechan JG and Blair GS, did their study on 440 patients using inferior alveolar nerve block. The incidence of positive aspiration using two different automatic aspirating syringes had 4 cases of adverse effects. They were a case of nausea, a case of syncope and two cases of palpititation or tachycardia.

In our study we did not encounter any complications while giving inferior alveolar nerve block in all four techniques.