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Comparison of Efficacy and Safety of Transverse Cervical Block and Local Infiltration of Lignocaine in Incision and Drainage of Submandibular Space Infections

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ABSTRACT:
Background: Odontogenic infections are the most common source of spreading facial space infections. These infections can cause severe or even life threatening sequelae when they involve adjacent tissue spaces of head and neck. Incision and drainage becomes necessary to assure fast resolution of these infections and in some cases to maintain a patent airway. An adequate level of anaesthesia is critical for the successful completion of the procedure. Skin over the submandibular region is supplied by the transverse cervical branches of cervical plexus. Hence a transverse cervical block which is a modified superficial cervical plexus block can safely and effectively relieve the pain of incision and drainage of submandibular space infections without the higher risk and cost of general anaesthesia. However, concerns about the safety of a nerve block often precludes it's use. The present study compared the efficacy and safety of transverse cervical block and local infiltration of lignocaine in incision and drainage of submandibular space infections.
Aim of the Study: To compare the efficacy and safety of transverse cervical block and local infiltration of lignocaine in incision and drainage of submandibular space infections.
Materials and Methods: The study protocol involved incision and drainage of 40 patients with acute submandibular space infections requiring extra-oral drainage who were divided into infiltration and block groups of equal participants. Clinical parameters evaluated were pain of injection and degree of discomfort during incision and drainage using0-100 mm visual analogue scale (VAS).
Results: A general trend of lower pain scores for the block group was seen according to the VAS ratings for injection pain. VAS ratings for procedure pain also showed significant lower pain scores for the block group. 3 patients from the block group complained of postoperative pain at the injection site which resolved after few days.
Conclusion: Transverse cervical block provides significant intra-operative pain control over the local infiltration for incision and drainage of submandibular space infections.
Keywords: Submandibular space infections, Transverse cervical block, Incision and drainage.

I. INTRODUCTION:

Odontogenic infections can range widely in presentation and severity from confining to pulpal, periapical or periodontal tissues to involving adjacent tissue spaces and spread along contiguous fascial planes of head and neck. Proximity of these fascial planes to central nervous system and critical respiratory passages mandates timely intervention to prevent severe life threatening sequelae[7, 8]. Incision and drainage becomes necessary when an abscess is detected clinically or radiologically, especially in an impending airway disaster and in cases of failure of medical therapy[3]. Success of surgical drainage depends upon thorough exploration of all locules to evacuate purulent material. However, infiltration anaesthesia provides inadequate pain control in inflamed and infected tissues, which is one of the most common reasons for failure of surgical drainage[4]. The limited availability and high cost of general anaesthesia is another concern which makes us think about the potential of regional nerve blocks that are often underutilised for various reasons.

The skin over the submandibular region is supplied by the transverse cervical branches of the cervical plexus that can be blocked by depositing anaesthetic solution at the Erb's point making it a good alternative of local infiltration for surgical drainage[5,6].

In spite of the documented safety of superficial cervical plexus block over deep cervical blockade and its efficacy in many cervical surge-

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ries, there is a paucity of clinical studies evaluating this technique for incision and drainage of cervical space infections[7, 8].

In the present study, anaesthetic efficacy and safety of blocking the transverse cervical nerves as they exit the posterior border of sternocleidomastoid muscle at the Erb's point is compared with local infiltration of lignocaine solution in patients undergoing incision and drainage for submandibular space infections.

II. MATERIALS AND METHODS:

40 patients between 18-57 years of age with acute submandibular space infections requiring extra-oral drainage were divided into infiltration and block groups based on a computer generated random number table. Patients with severe systemic diseases, psychiatric disorders and documented lignocaine sensitivity were excluded from the study. Written consent was obtained from each participant after explaining the procedure and the potential complications.

A standard regional anaesthesia tray with sterile towels, gauze packs, 10 ml syringe containing 1% lignocaine & 0.01% adrenaline solution fitted with 25-gauge needle, sterile gloves and marking pen; and a sterile tray form surgical drainage consisting of a curved haemostat, No. 11 BP blade with handle, sinus forceps, corrugated rubber drain, scissors and a sterile irrigating solution were prepared (Figure 1). The patients in the control group received infiltration of 10ml of 1% lignocaine with 0.01% adrenaline solution around the submandibular region. Those in the study group received the same drug through transverse cervical block.

Figure 1: Armamentarium

The patient is placed in the supine position with head tilted to the opposite side of procedure and after aseptically preparing the skin, the midpoint of the posterior border of the sternocleidomastoid muscle is located. A 10 ml syringe of local anaesthetic fitted with 25 gauge needle is introduced subcutaneously and 5ml of solution is injected. The remaining drug is injected after advancing the needle one inch superiorly in the same subcutaneous plane (Figure 2, 3). For all patients Hilton's method is employed for surgical drainage[9]. A small submandibular incision is placed two finger-breadths below the mandible, a pair of closed artery forceps is inserted into the wound and the beaks are opened. After collecting a sample pus for microbiological examination in a sterile syringe, the instrument is withdrawn with open beaks and reinserted in another direction. The process is continued until all locules of pus are broken, a corrugated rubber drain is inserted, sutured in place and a sterile dressing is applied.

Figure 2: Patient preparation

Figure 3: Transverse Cervical Block

Clinical parameters evaluated were pain of injection using 0-100 mm visual analogue scale (VAS) with 0 indicating 'no pain at all' and 100 indicating 'unbearable pain' and discomfort during incision and drainage. Any abnormal sensation or untoward reaction after the injection is recorded in the pro-forma. Statistical analysis was performed using SPSS software.

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III. RESULT:

42 patients with acute submandibular space infections requiring drainage were initially included in the study from 18-57 years of age out of which one patient refused to participate and one patient was excluded due to cardiac disease (Figure 4). The remaining participants were divided into infiltration and block groups based on a computer generated random number table.

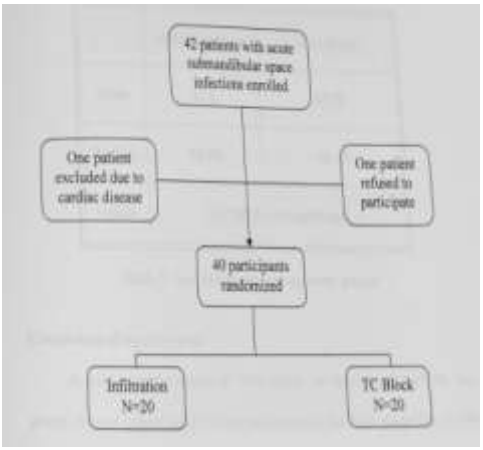

Figure 4: Patient flow during the study

A general trend of lower pain scores for the block group was seen during VAS ratings for injection pain (Figure 5, 6). Two tailed t test was employed. There was highly significant difference between the groups when injection pain was compared (Table 1).

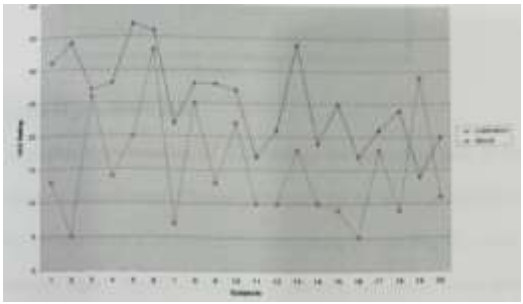

Figure 5: VAS ratings for injection pain

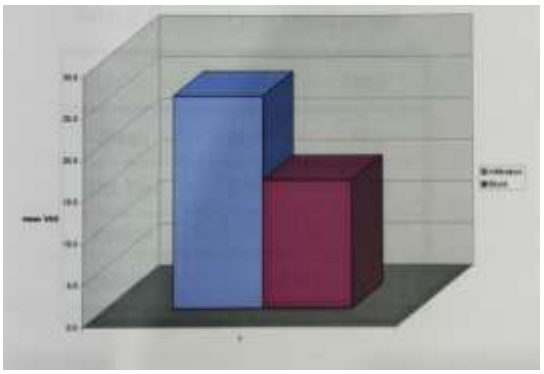

Figure 6: Mean injection pain among groups

	Infiltration	Block
Mean	25.5	15.35
Std. Dev	6.67	8.16
t value	4.45	
Significance	0.01*	

*99% confidence interval

Table 1: Injection pain among groups

VAS ratings for procedure pain was also compared (Figure 7, 8) and the two tailed t test also showed significant lower pain scores for the block group (Table 2). Three patients from the block group complained of postoperative pain at the injection site which resolved after few days and one patient from the same group developed a small hematoma of 0.5 cm diameter.

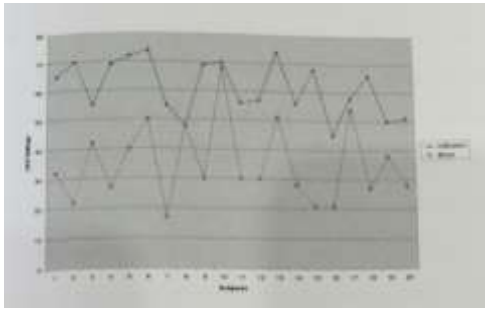

Figure 7: VAS ratings for procedure pain

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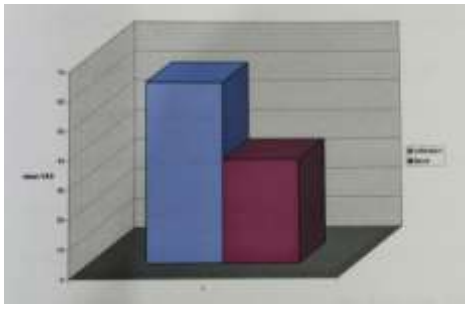

Figure 8: Comparison of mean procedure pain

	Infiltration	Block
Mean	61.4	35.2
Std. Dev	9.26	13.33
t value	7.22	
Significance	0.01*	

*99% confidence interval

Table 2: Procedure pain among groups

IV. DISCUSSION:

A variety of local anaesthetic techniques like local infiltration, intra-oral and extra-oral blocks of different branches of the trigeminal nerve are traditionally employed for satisfactory pain control during routine surgical procedures. However, in certain anatomical and clinical situations, these techniques are not adequate, especially in fascial space infections.

Owing to the differential growth of the facial skin and bones, a small region of face overlying the angle of the mandible receives sensory innervations from the cervical cutaneous plexus which makes cervical plexus block an ideal technique for pain control during submandibular space infections[6, 10]. But despite its wide use in many procedure of the neck, it is not readily considered by oral and maxillofacial surgeons due to lack of familiarity of technique and concern for safety[11, 12].

Cervical plexus can be blocked at superficial or deep levels. Superficial cervical plexus block is easy to perform and teach, safe compared to deep cervical blockade and randomised controlled trials have demonstrated equivalent anaesthetic efficacy for superficial and deep blocks[13,14]. Pundit and co-workers in their study suggested that superficial cervical space communicates with the deep cervical space[15]. Zhang et al and Nash et al also provided anatomical evidence to support the fact that deep cervical spaces continue directly with the subcutaneous tissue through the potential spaces of fatty tissue around the sternocleidomastoids, thereby allowing unimpeded spread of injected solution[16, 17].

The superficial technique is inherently simple and safe. It is a subcutaneous injection along the posterior border of the sternocleidomastoid and the major structure in immediate proximity is the external jugular vein, which is readily visible and can be easily avoided[18]. According to Jones and Candelaria, it is a regional block of lateral neck performed at Erb's point which is located at the junction of superior and middle thirds of the sternocleidomastoid muscle[19]. Kim et al studied the emerging patterns of the cervical cutaneous nerves in Korean population and demonstrated that an injection in the middle of the posterior border of the sternocleidomastoid will block the greater auricular and transverse cervical nerves, using the conventional anaesthetic procedures and this finding was different from the ones by Jones and Candelaria due to racial differences and needs further clarification[20]. Considering this difference in opinion, a modified approach was used in our study by inserting the needle subcutaneously at the midpoint of sternocleidomastoid injecting half of the local anaesthetic solution there and the remaining drug is injected after advancing the needle one inch superiorly in the same subcutaneous plane to improve the anaesthetic efficacy.

Pain is a subjective sensation and therefore difficult to measure. Salo et al clearly demonstrated that patients could accurately read a VAS for pain irrespective of age or education level[21]. In our study, the reduction in injection pain after transverse cervical block, though statistically significant, was not found to be clinically significant. However, the reduction in procedure pain after transverse cervical block was both statistically and clinically significant. No serious adverse event was reported by subjects in either group apart from minor complications like pain in injection site and hematoma in block group which were self limiting and resolved in the next few days. From the relatively minor nature of complications, it may be assumed that the superficial cervical block is a reasonably safe procedure, which can be routinely used for incision and drainage of submandibular space infections.

There were several limitations to the present study like the operators not being blinded and hence chances of bias, inherent variability in pain thresholds of patients that necessitates larger groups for comparison, the chances of cross innervations from the opposite side and trigeminal area were not considered, patients with bilateral incision and drainage were not given infiltration on one side and transverse cervical block on the other side

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which could have compared the anaesthetic efficacy more efficiently. In spite of limitations, this study indicates that transverse cervical block is a valuable technique which can safely and easily administered on an outpatient basis for better pain control during incision and drainage of submandibular abscesses.

V. REVIEW OF LITERATURE:

All odontogenic infections originate in the tooth pulp or periodontal tissues. Anatomical factors play a key role in the presentation of bacterial infection, once they have spread beyond the confines of the jaws[22, 23]. Grodinsky and Holyoke[24] demonstrated in 1938 that the spread of infection tends to follow the lines of least resistance, which are dictated by the bone and periosteum, muscle and fascia and in a second article they described this with special reference to the clinical entity known as Ludwig's angina[25].

Among several spaces, the submandibular space is one of the first to be involved by odontogenic infection and is also one of the most commonly involved spaces in deep neck infections. CT and MR imaging clearly demonstrated three different types of pathways of odontogenic infection spread into the submandibular space: through the mylohyoid muscle or sublingual space, through the bony structures of the mandible, or from the masticatory space[26].

The procedure for incision and drainage of a submandibular abscess by Hilton's method was described by Moore. Procedural discomfort is often under-treated and can be distressing for patient[27].The nerve block technique for establishment of local anaesthesia of infected areas has several advantages over infiltration. The cervical plexus is formed by the ventral primary rami of the first four cervical nerves. The deep nerves gives off four superficial cutaneous branches that are the lesser occipital, great auricular, transverse cervical and supraclavicular nerves (Figure 9). Previous reports have demonstrated the efficacy of cervical plexus block in providing surgical anaesthesia for surgical procedures of the neck and it is documented that in all these procedures cervical plexus block provides pain control comparable to general anaesthesia[28]. Although the deep block produces some paralysis of the musculature of the neck, superficial cervical plexus block gives only sensory blocks, and muscle relaxation will not be achieved which is not needed in surgical drainage of submandibular space infection, and this makes it an ideal technique for adequate pain control during surgical drainage. It is generally accepted that superficial cervical plexus block is easier to perform, easier to teach and associated with fewer complications than the deep block[29].

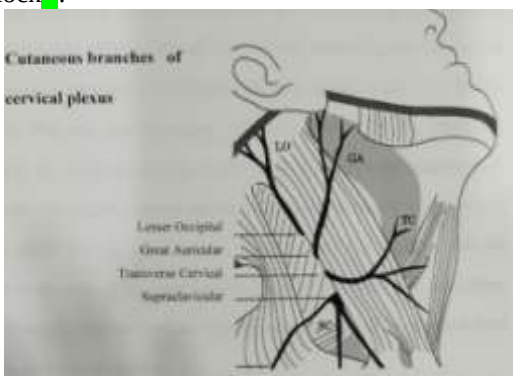

Figure 9

VI. CONCLUSION:

This prospective, randomised study suggests that transverse cervical block provides statistically and clinically significant improvement in pain control over the local infiltration technique for incision and drainage of submandibular space infections. The pain of injection is comparable in both techniques as clinically significant difference was not observed when transverse cervical block and local infiltrations were compared. The safety of transverse cervical block is comparable to local infiltration technique as no serious complication was reported after any of these techniques. However, self limiting, local complications were reported after transverse cervical block. Further large controlled trials, preferably comparing these techniques bilaterally in the same patient, are necessary to validate our findings.

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