# Clinical Evaluation of the Gow-Gates Technic on Pedodontic Patients: A Preliminary Report

by

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# INTRODUCTION

In 1973 Gow-Gates[20] reported a new technic for mandibular block anesthesia which uses both extra-oral and intra-oral landmarks. Subsequently, Watson and Gow-Gates[34] reported this technic to be more reliable than the conventional inferior alveolar nerve block.

The anatomic target zone for the Gow-Gates technic lies on the condylar neck and unlike more conventional technics, a single injection site is claimed to anesthetize the three major peripheral branches of the mandibular nerve; the inferior alveolar, lingual, and buccal. Additionally, the Gow-Gates technic was reported to require fewer supplemental injections than orthodox technics and may cause less pain on penetration and injection. Most previous studies on the Gow-Gates technic[20,21,37,44] were performed on patients attending typical urban practices in Australia and the United States and few details of the patient's selection criteria, including the age range of subjects, has been reported. More recently, Sanders[39] advocated the Gow-Gates injection technic for use in children.

Therefore, the efficacy of the Gow-Gates technic on a pediatric population has not been substantiated.

This study intends to compare conventional and Gow-Gates technics of mandibular block anesthesia in pediatric dental patients.

# REVIEW OF THE LITERATURE

## I. ANATOMIC CONSIDERATIONS

After passing through the oval foramen, the mandibular nerve, the third division of the fifth cranial nerve, enters the infratemporal fossa deep to the upper head of the lateral pterygoid muscle. The four sensory branches of the mandibular nerve, i.e., buccal, lingual, inferior alveolar, and auriculotemporal nerves, separate from each other usually 5 to 10 mm. below the oval foramen.[14]

The anatomy of the three mandibular nerve branches of dental interest, i.e., buccal, lingual, and inferior alveolar nerves, is described generally as below.[14,25,32,42]

The pterygomandibular space, which is the part of the infratemporal fossa, contains the lingual and inferior alveolar nerves, inferior alveolar artery and vein, portions of the pterygoid plexus of veins and is filled with loose connective tissue with a variable amount of fat. This is a well-defined space between the mandibular ramus and the pterygoid muscles. Its lateral wall is formed by the medial surface of the mandibular ramus, its medial wall is formed by the medial pterygoid muscle and its superior wall is formed by the lateral pterygoid muscle.

The inferior alveolar nerve passes through the pterygomandibular space obliquely from above and medially in a downward and lateral course until it reaches the mandibular foramen. When the mandible is at rest or occluded, the nerve is slack in the pterygomandibular space and in a flat S-shaped configuration. During wide mouth opening, the nerve loses its S-shape becoming more straight in concert with the stretched inter-pterygoid fascia to which it attaches.

The lingual nerve lies in the pterygomandibular space anteriorly and medially to the inferior alveolar nerve. This nerve receives the chorda tympani just as it enters the pterygomandibular space at the lower border of the lateral pterygoid muscle. Then, the lingual nerve follows the lateral surface of the medial pterygoid muscle coursing downward and slightly outward. It is at a short distance behind the temporal crest and the deep tendon of the temporal muscle in the plane of the mandibular foramen. At the level of the upper end of the mylohyoid line, the nerve turns anteriorly to enter the oral cavity proper. It continues horizontally on the superior surface of the mylohyoid muscle.

The buccal nerve, running through the infratemporal space in a downward and forward direction, passes between the two heads of the lateral pterygoid muscle and crosses the deep surface of the temporal muscle. As this nerve passes anteriorly it penetrates the buccinator muscle about 1 cm. above the mandibular occlusal plane.

Because of its anatomical relationship, the inferior alveolar nerve is nearest the medial surface of the ramus at the mandibular foramen. Therefore, this foramen has been the clinical target zone of the inferior alveolar block injection. Practically speaking, the technic of depositing anesthetic solution at the region of mandibular foramen has been described as placing the needle at the top of or near the mandibular lingula.

Numerous studies[4,5,8,23,24,31,35,42] have been carried out to determine the relative topography of the mandibular foramen and surrounding structures. These include direct measurement of the foramen location in dry skulls, radiological assessment, and cadaver dissections of the pterygomandibular region.

Examining 400 skulls, Bremer[8] showed that in most cases the height of the coronoid notch is on a level with or slightly above the lingula (mean: .52 mm. above). However, 20% were as much as 4 mm. below the lingula. The mean distance of the lingula above the occlusal plane was measured to be 4.9 mm. but was more than 10 mm. above the occlusal plane in 4.8% of the cases. It was found that the sulcus lay on the medial surface of the ramus and in the posterior third of that structure. Similarly Hayward[24] studied the anteroposterior position of the mandibular foramen using 107 skulls. The foramen was also found to be located in the third quadrant posteriorly. Harrison[23] took measurements of the relative position of the mandibular foramen in the developing mandible using the distance from the center of lingula to the borders of ramus. She showed both wide variation between subjects and also between right and left sides in the same individual. Reitzik[35] studied 100 skulls radiographically to find the position of the tip of the lingula and compared it with the position of the midpoint of a line across the "waist" of the mandibular ramus. This study showed that the midpoint of the narrowest anteroposterior line of the ascending ramus ("waist") mostly lies anterior and inferior to the tip of the lingula but again with much variation. Studying 60 lateral cephalograms of both children and adults, Benham[5] examined the changes of position of the mandibular foramen. Relating the foramen to the mandibular occlusal plane he showed a progressive increase in height with increased age.

Other authors have similarly described the position of the foramen. Archer[3] said that the mandibular sulcus bisects a line which is drawn between the coronoid notch and a depression present on the posterior

surface of the ramus. Jorgensen[25] wrote that a plane drawn through the coronoid notch and parallel with the occlusal surface passes just above the lingula of the mandible and that the distance from the lingula to the internal oblique line (temporal crest) is the same (within a 1 mm. variation) irrespective of the width of the ramus or the age of the individual. Allen[2] states that the mandibular foramen is located in the middle to posterior 1/3 of the ramus in an anteroposterior direction and at a variable distance above or below the mandibular occlusal plane. By contrast Levine[27] has stated that the opening of the mandibular canal is always midway between the anterior and posterior borders of the ramus.

In the mandible of a young child, the position of the foramen is claimed to be situated at a level below the occlusal plane[7,17,34,36] and the foramen and sulcus are located posteriorly on the medial border of the ramus.[11,40]

## II. CLINICAL TECHNICS

Clinically, knowledge of anatomy and prior studies of human hard and soft tissue structures are of help but individual differences can be so large that there is still no guarantee of success. It is safe to say that each dentist has his own particular way of performing the mandibular block injection. It is also true that in spite of these variations the success rate is relatively high.[9,12,13,15,16,19]

Several specific approaches to administering the inferior alveolar nerve block have been described.[1,10,14,32,38,41] Most technics of mandibular nerve block are initiated by identifying the intra-oral soft tissue landmarks. As an area of penetration, the pterygomandibular

(pterygotemporal, retromolar) depression is usually chosen. In determining the height of needle penetration, the nail-bisecting technic is commonly used. The thumb or forefinger is rested against the anterior border of the ramus initially palpating the deep tendon of the temporal muscle and/or internal oblique line. Then moving the finger somewhat laterally, the buccal fat pad is retracted leaving the retromolar depression easily identifiable. The orientation of the needle advancement is usually parallel to the mandibular occlusal plane in adults. However, in children, needle insertion may be somewhat downward to this plane. The direction of advancement of the needle is related to the divergence of the mandibular ramus, but, usually is approximated by placing the barrel of the syringe over the contralateral premolar area.

In describing his technic, DuBrul[14] states that the needle is to be passed over the ridge of the mandibular neck to reach the groove of the sulcus colli which continues to the mandibular foramen. Northrop[32] has also stated that it is necessary to carry the point of the needle to the mandibular sulcus (sulcus colli) to achieve inferior alveolar nerve anesthesia. In determining the height of needle insertion into oral mucosa, DuBrul states that the index finger should be placed on the occlusal surface of the last molar, the nail facing upward thus indicating the suitable plane of insertion. The needle then pierces the mucous membrane above the fingernail and behind the deep tendon of the temporal muscle. Similar to other variations, syringe axis is parallel to the occlusal plane of the lower molars and across the frontal plane as far as possible. After the needle is inserted a short distance, it usually touches bone. The needle axis is then changed, allowing penetration along the inner

surface of the ramus into the groove of the mandibular neck. DuBrul[14] states that the deposition of anesthetic should be made not more than 3 to 4 mm. above the mandibular occlusal plane. He also states that the mandibular foramen is situated about halfway between the anterior and posterior borders of the mandibular ramus and is found in a plane which is parallel to the lower border of the mandible. Northrop,[32] in describing his method which also aims at the mandibular sulcus, is more specific about the depth of needle penetration. Using a nail bisecting technic, the needle is introduced just medially to the internal oblique line at the height of 1 cm. above the occlusal plane from an anterior direction and is carried below the mucosa for 1 cm. A second maneuver moving the syringe over the second bicuspid or first molar of the contralateral side of the mouth is followed by inserting the needle another 2.5 cm. A further modification of this technic judges the width of the ramus by placing the thumb within the mouth and the third finger extraorally on the posterior border of the mandibular ramus and estimating 2/3 of the distance from the external oblique line to the posterior border of the ramus.

Deposition of the anesthetic solution more cephalad was described by Clarke and Holmes.[10] This approach is said to overcome the occasional difficulty in anesthetizing the inferior alveolar nerve. Sargenti[38] reports another high approach. In his technic, the barrel of the syringe is placed in contact with the upper premolars of the contralateral side. Akinosi[1] also recommends the use of high needle insertion to enhance the efficacy of anesthesia. However, his technic is unusual in that the teeth are occluded and the needle is placed into the embrasure between the vertical ramus and the maxillary tuberosity at the level of

the maxillary marginal gingiva parallel to the upper occlusal plane. The needle is advanced 2.5 to 3.0 cm. until reaching the superior portion of the pterygomandibular space where the three major branches of the mandibular nerve are ostensibly in close proximity. This "tuberosity" approach to the three branches of mandibular nerve is particularly useful when mouth opening is limited. Interestingly, this technic is reported not to be reliable in children.

Radiographic studies of anesthetic solution mixed with radiopaque substances show interesting findings. Berns[6] found that a sigmoid distribution of the fluid was the most common pattern; the fluid migrating in a superior and posterior direction from the site of original deposition. However, he emphasized that this was a general finding and that no absolute statement about a distribution pattern could be made. A similar study by Galbreath[18] had comparable results. But, injections given as much as 5 mm. below the foramen gave clinically excellent anesthesia in 80% of the cases and the solution was often observed to migrate above the foramen. The success rate of injection within 5 mm. inferior to the foramen (80%) is similar to those within 5 mm. range superior to the foramen (77%). Injections made 6 to 15 mm. superiorly to the foramen, however, had only 42% successful anesthesia. Thus the general assumption of many individuals that it is desirable to inject above the lingula allowing downward diffusion to the nerve in the sulcus may not always be true.[33]

## III. GOW-GATES TECHNIC

(Figures 1 and 2)

In 1973 Gow-Gates[20] reported a new block technic which uses extra-oral landmarks in addition to the intraoral ones. In this technic, the needle is inserted at a much higher point just below the palatal cusps of the maxillary second molar. The axis of this injection extends approximately from the intertragic notch of the ear through the corners of the mouth aiming the needle at the posterior border of the tragus as a target area. The deposition of anesthetic solution is at the neck of the condyle below the insertion of the lateral pterygoid muscle. This high approach is said to anesthetize the inferior alveolar, lingual, buccal, and supplementary nerves simultaneously. Gow-Gates has also claimed a reduction of the failure rate to a negligible number as well as increased procedure comfort. In a clinical evaluation report in 1976, Watson[44] confirmed the previous statements of Gow-Gates.[20] His tests for a response to a sharp probe in the distribution of the buccal and lingual nerves confirmed consistent anesthesia of these nerves along with the inferior alveolar nerve.

Clinical evaluation of the Gow-Gates technic by Robertson[37] again showed a significantly lower failure rate for inferior alveolar anesthesia as compared with a standard technic. Sixty-two percent of the Gow-Gates injection also produced buccal nerve anesthesia.

## METHODS AND MATERIALS

Healthy (ASA I or II[28]), unpremedicated children and adolescents aged 4 to 16 were randomly divided into two groups. One group received mandibular block anesthesia by the Gow-Gates technic and another group by a conventional technic. Each group consisted of 11 patients who required routine restorations or extractions of mandibular primary canines, molars or permanent premolars and molars. Both groups were comprised of patients attending the Pedodontic Graduate Clinic of the University of Oregon Dental School or the Outpatient Clinic of the Hospital Dental Service of the University of Oregon Health Sciences Center. An aspirating syringe containing 1.8 ml. of 2% lidocaine hydrochloride with 1:100,000 epinephrine, and disposable 27 gauge 1¼ inch needles were used. Before needle insertion, the area was dried and a topical anesthetic was applied.

Criteria for study were as follows: speed of onset, depth of anesthesia, initial pain, type and site of work, reaction to the injected solution, aspiration of blood, age, and sex.

Speed of onset was assessed from the time of completion of injection to onset of paresthesia/anesthesia of the lip, tongue, and chin within the appropriate nerve distribution. This time was measured by using a stopwatch.

The depth of anesthesia was graded according to the following descriptions[13]: Grade A; clinically excellent anesthesia satisfactory to both the patient and clinician throughout the procedure. Grade B; subtotal anesthesia in which the patient has minor discomfort but does not require a supplementary anesthetic. Grade C; inadequate anesthesia in which the patient requires a supplemental injection.

Initial pain means the pain expressed on penetration and/or injection. Reaction to the injected solution refers to any unexpected or undesired side effects including anxiety, tremor, excessive diaphoresis, or syncope.

The author performed the injection on all subjects using the Gow-Gates technic or the conventional technic, and also acted as the observer-recorder.

Contrary to prior studies, the Gow-Gates technic was modified such that the patient's face was not placed in a horizontal position as originally recommended,[20] but all patients were placed in a semisupine position to more easily permit the controlling of movement. With the patient's mouth maximally opened, the clinician's index finger is placed on the skin just anterior to the tragus of the ear and over the translocated condyle. The thumb is placed intraorally over the anterior border of the coronoid process and simultaneously retracting soft tissue laterally. The needle axis is from the contralateral cuspid up to the point of insertion just medial to the deep tendon of the temporal muscle and lateral to the pterygomandibular fold but at the height of the palatal cusps of the most distal maxillary tooth. The needle is then advanced through the connective tissue between the ramus and the medial pterygoid muscle, the target zone being the neck of the mandibular condyle below the insertion of the lateral pterygoid muscle. Bone is usually encountered at approximately 18 to 22 mm. penetration in young children. The needle is then withdrawn 1 to 2 mm. and aspiration performed. If positive, the needle is relocated prior to injection. One point eight milliliter of anesthetic solution is then deposited over a period of approximately 20 seconds. Then the patient is asked to keep his/her mouth open for about 20 seconds

after completion of the injection.

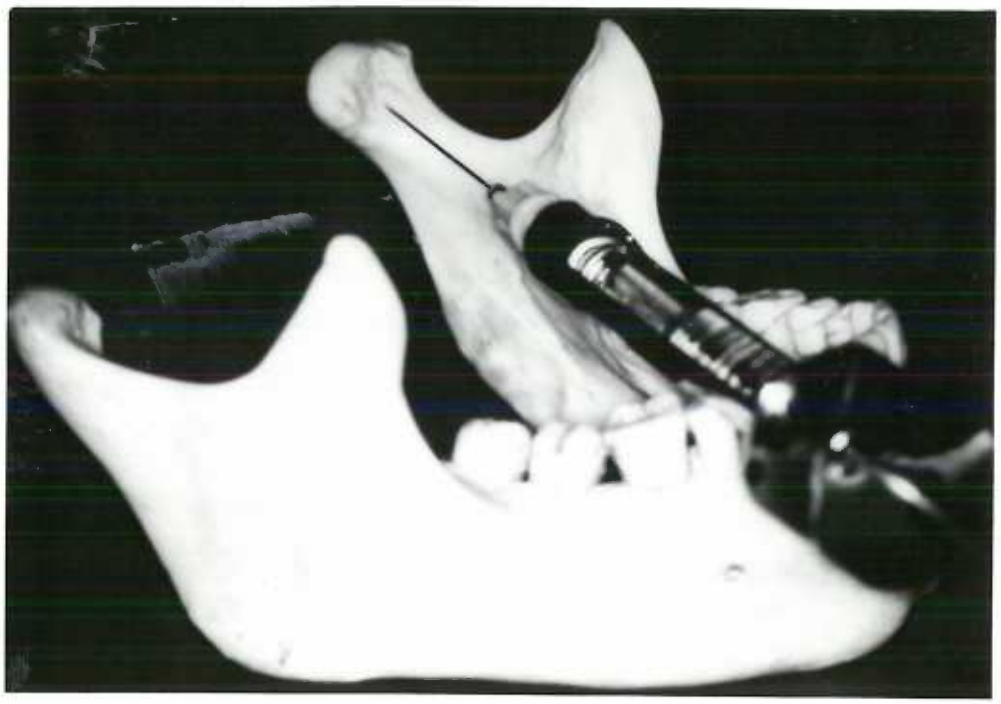
With the conventional technic,[14,26,29,39] the thumb was placed on the occlusal surface of the molars with the fingernail resting on the internal oblique line or ridge and the ball of the thumb resting in the retromolar fossa. The second and/or third fingers are placed extraorally at the posterior border of the ramus to support this thumb positioning and to judge ramal size. The syringe is directed on a plane from the opposite primary first molar (first premolar) area. The needle is inserted medial to the internal border of the ramus and lateral to the pterygomandibular fold bisecting the thumbnail and is directed parallel or slightly below the occlusal plane. If bone is contacted at the posterior surface of the mandibular sulcus, the needle withdrawn 1 to 2 mm. and aspiration performed. If positive, the needle is relocated and aspiration reattempted before deposition of the anesthetic. Approximately 1.5 ml. of the solution is deposited in the region of the inferior alveolar nerve. Also this procedure usually anesthetizes the lingual nerve.[2,32,36] Subsequently, 0.3 ml. of the solution is deposited in the mucobuccal fold at a point distal and buccal to the most distally located tooth. This buccal block was always performed in addition to the inferior alveolar and lingual nerve block.

## RESULTS

The results are summarized in Figure 3 and Tables 1, 2, 3 and 4.

Grade A anesthesia was obtained in all cases utilizing the Gow-Gates injection (Table 1). Conventional injection failed to achieve

a. Gow-Gates approach



b. Conventional approach

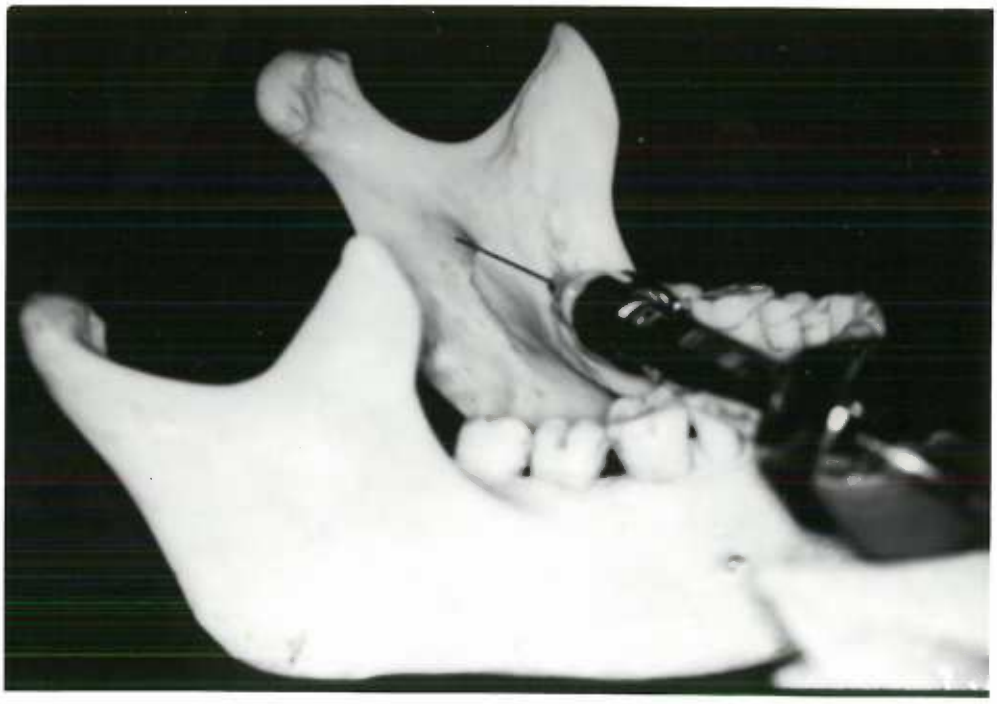


Figure 1. Note the difference between the level of needle placement of a and b. The Gow-Gates approach, aiming at the condylar neck, has much higher level than the conventional one.

a. Gow-Gates approach

b. Conventional approach

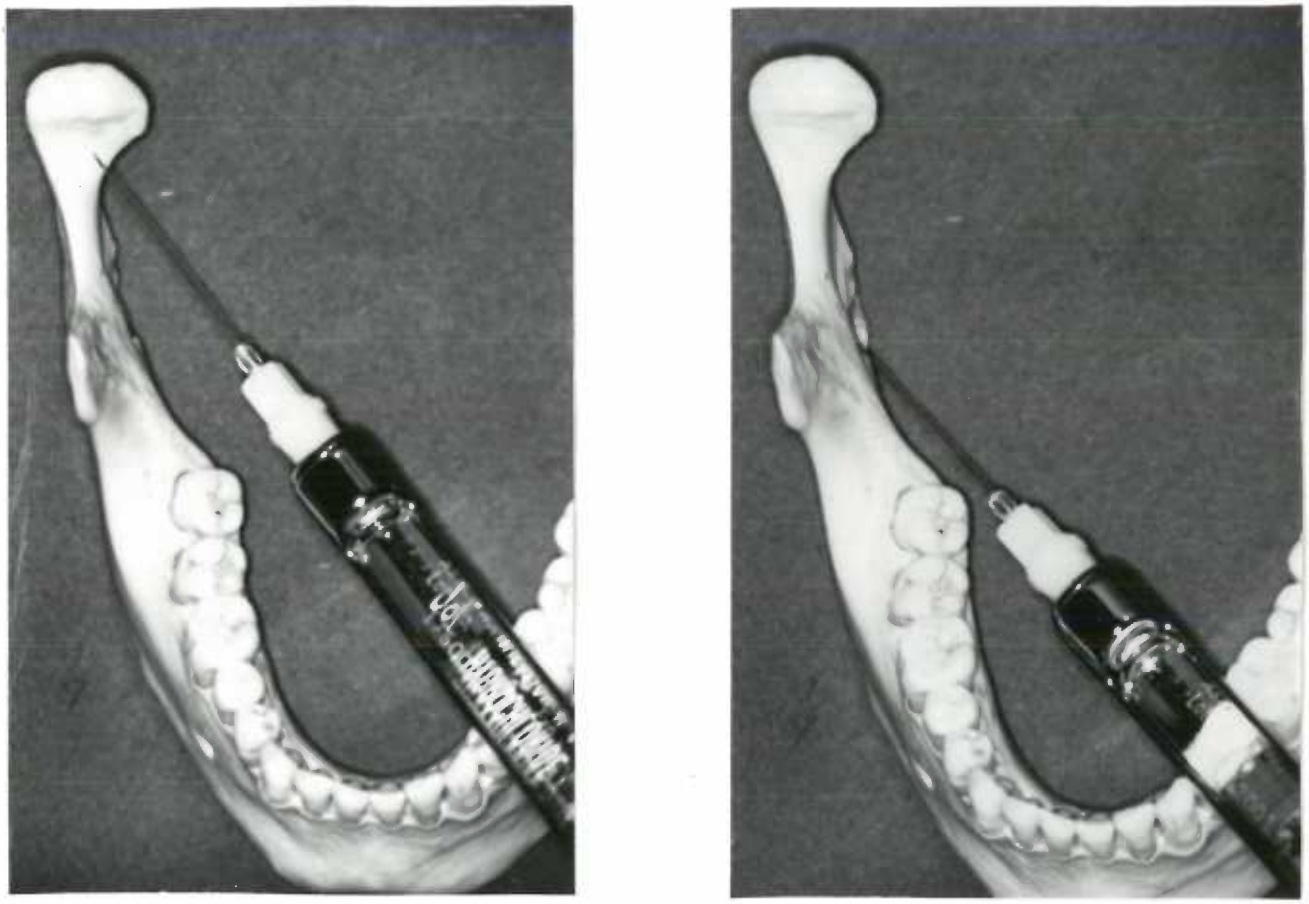


Figure 2. Note that the Gow-Gates approach has more definite end point in needle placement.

adequate anesthesia (Grade C) in 18.2% of the cases and supplemental injections were necessary. Subtotal anesthesia (Grade B) was obtained in 9.1% cases of the conventional group.

Onset of anesthesia was similar in both groups. (Table 2)

Positive blood aspiration occurred in 1 patient in each group.

Moderate to severe pain on needle insertion and injection did not occur in any of the Gow-Gates group but did occur 36.4% of the time in the conventional group. (Table 3) Mild discomfort with injection was seen in 36.4% of the Gow-Gates cases and in 54.5% of the conventional cases and a pain-free injection was executed in 63.6% in the Gow-Gates but only in 9.1% of the conventional group.

No untoward reactions or complications were seen in either group.

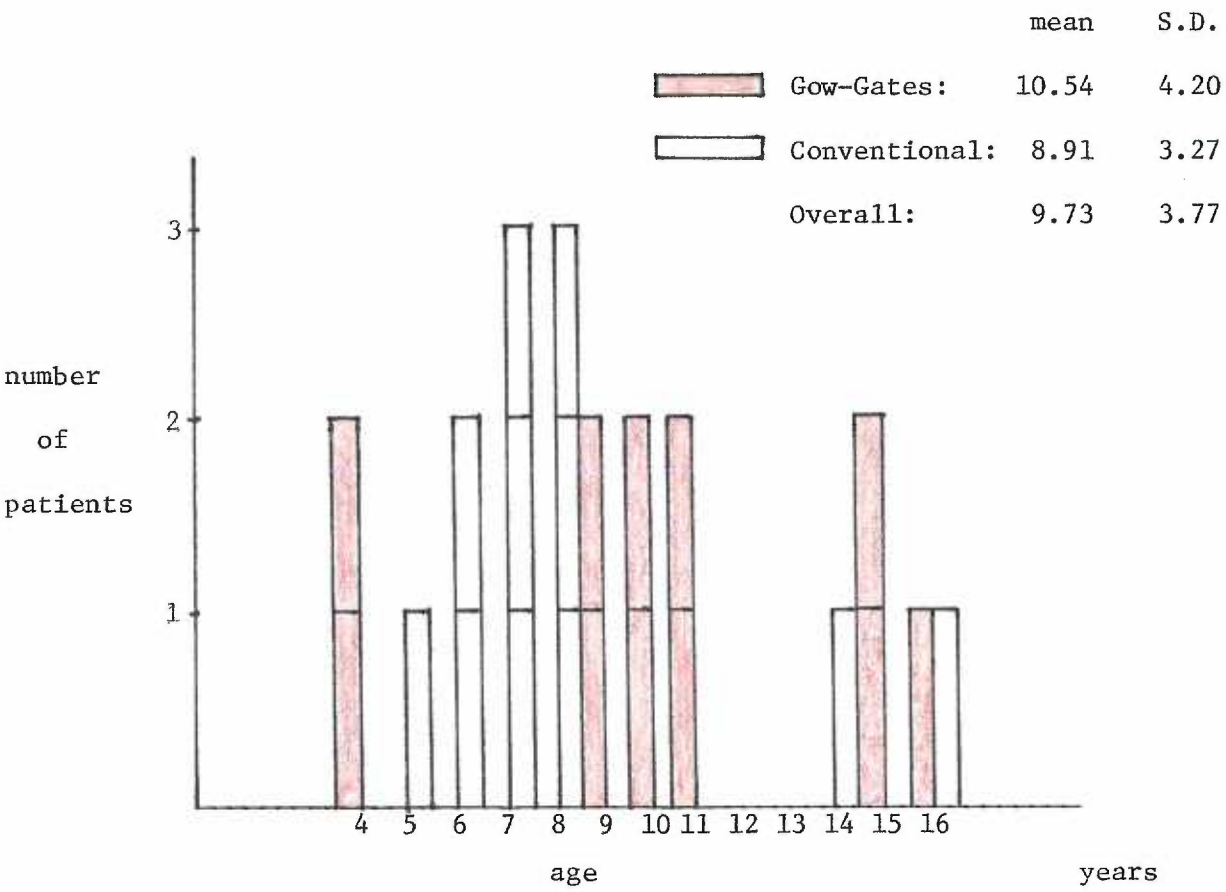
The mean age of the Gow-Gates group was 10 years 6 months old and 8 years 11 months old for conventional group. Overall mean age of the subjects was 9 years 9 months old. Age distribution is shown in Figure 1.

Right and left side distribution was similar in the Gow-Gates group while in the conventional group 36.4% were right sided and the remainder left sided injections. (Table 4)

Sex distribution was similar in both groups of patients.

## DISCUSSION

The results of any clinical investigation of a local anesthesia technic are largely based upon subjective findings, and will be only suggestive rather than conclusive[19] and the true merit of any procedure becomes apparent only after extensive or repetitive studies. In this




t-value of the two: 1.019, $.3 < p < .4$, nonsignificant

Figure 3. Age distribution

Table 1. Grade of Anesthesia

| Grade* | Gow-Gates number | Gow-Gates % | Conventional number | Conventional % |
|---|---|---|---|---|
| A | 11 | 100 | 8 | 72.7 |
| B | 0 | 0 | 1 | 9.1 |
| C | 0 | 0 | 2 | 18.2 |

*Grade A: clinically excellent anesthesia satisfactory to both the patient and clinician throughout the procedure
B: subtotal anesthesia in which the patient has minor discomfort but does not require a supplementary anesthetic
C: inadequate anesthesia in which the patient requires a supplemental injection

Table 2. Speed of onset (in minutes)

| Gow-Gates | | | Conventional | | |
|---|---|---|---|---|---|
| mean | S.D. | range | mean | S.D. | range |
| 2.0 | 1.20 | 1.0-5.0 | 2.32 | 1.08 | 1.0-4.0 |

t-value of the two: .469, $.6 < p < .7$, nonsignificant

Table 3. Pain response on insertion/injection

| | Gow-Gates | | Conventional | |
|---|---|---|---|---|
| | number | % | number | % |
| Moderate to severe | 0 | 0 | 4 | 36.4 |
| Mild discomfort | 4 | 36.4 | 6 | 54.5 |
| Pain-free | 7 | 63.6 | 1 | 9.1 |

Table 4. Type and site of work

| | Case Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Gow-Gates | | | | | | | | | | | |
| type | op* | op | ex# | ex | op | op | op | op | op | op | op |
| site | 19 | 30 | 28 | 21 | K | R/S | 18/19 | 30/31 | 18 | 19 | 30 |
| Conventional | | | | | | | | | | | |
| type | op | cr† | cr | op | op | op | op | op | op | op | op |
| site | T | L | 19 | 31 | S/T | 19 | 19 | 29/30 | L | K | L |

* operative; # extraction; †stainless steel crown

respect, the results of this study clearly agreed with the general claims made by previous workers,[20,21,37,44] although prior studies were primarily involving adults. The study also tends to confirm the unpublished data reported by Sanders,[39] that is that the Gow-Gates technic is more reliable and less painful than the standard mandibular block for the pediatric patient. Our findings (Table 3) indicate much fewer pain responses in the Gow-Gates group when compared with the conventional group on insertion and/or injection. However, most of the pain responses in our conventional group were evoked during buccal nerve block injections. The probable reason for this response is that the area does not have much loose areolar tissue while the pterygomandibular space contains much areolar tissue.[25] In our study and many others, the buccal nerve block is considered a routine part of mandibular anesthesia for both restorative and surgical procedures of the mandibular posterior teeth.

Clinical experience reveals that the inferior alveolar nerve injection by a conventional technic occasionally anesthetizes the buccal nerve,[3,32,36] but as a rule, it is usually necessary to have a separate buccal injection. The "painless" characteristic of the Gow-Gates technic may be partially from the fact that one does not ordinarily need a separate injection to achieve buccal nerve anesthesia. This does require that the Gow-Gates technic consistently anesthetize the buccal nerve together with other major divisions of the mandibular nerve. No specific data was given on buccal nerve anesthesia by the Gow-Gates technic in the clinical study by Watson.[44] However, he did state that responses to sharp stimuli in the region of buccal nerve distribution and freedom from pain during procedures confirmed consistent buccal nerve anesthesia.

In contrast, Robertson[37] showed only a 62% success rate in anesthetizing the buccal nerve with a single Gow-Gates injection. In the present study a preliminary test for anesthesia of buccal nerve was not done. Our results reveal that the Gow-Gates technic resulted in 100% adequate anesthesia for actual procedures manipulating tissues innervated by the inferior alveolar, lingual, and buccal nerves.

Watson,[43] in a discussion of the relationship of the mandibular nerve trunk, the root of the buccal nerve and the point of a needle during injection by the Gow-Gates technic, stated that close proximity was the reason for the success in anesthetizing the buccal nerve simultaneously with the inferior alveolar and lingual nerves when using the Gow-Gates technic.

The absence of a moderate to severe pain response on insertion and/or injection in the Gow-Gates technic was notable when compared with the 36.4% associated with a conventional technic. Previous studies did not have exact data on pain responses but Gow-Gates[20] stated that penetration of the needle produces little or no pain because of the absence of terminal nerve endings.

The lower rate of clinically excellent anesthesia and the higher failure rate (18.2%) in the conventional technic necessitated supplemental injections. This result also supports the known difficulty in consistently finding the opening of the mandibular canal. Clearly identifying the intraoral landmarks and palpating bone and overlying soft tissues are of great help but in no way insure successful anesthesia. Depth of penetration to reach the mandibular sulcus by conventional technic varies by authors: less than ½ inch,[3] 1.5 cm.,[25] 16 mm.,[30] 1 to 2 cm.,[2]

2.5 cm.,[32] and 2 to 3 cm.[35] for adults and less than 1 inch,[11] and 15 mm.[29] for children.

Studies trying to identify a constant relationship between the mandibular foramen and/or sulcus and surrounding landmarks such as the mandibular occlusal plane, coronoid notch, a line drawn between the coronoid notch and the concavity of the posterior border of the ramus ("waist") only show that none of them bear a constant relationship to the target zone.[33] Moreover, palpable bony structures are often distorted by the relationships of overlying soft tissues such as the amount of subcutaneous fat and the volume of musculature. Also, palpability of the posterior border of the mandible depends on the thickness of the parotid gland.[14] In avoiding these variations, Gow-Gates[20] uses the plane extending from the intertragic notch through the corner of the mouth for needle alignment to help localize the point of needle insertion. He further suggests that this use of extra-oral landmarks enhances aiming of the target area which is at the lateral region of the condylar neck just below the insertion of the lateral pterygoid muscle.[21] Although the anatomical basis for the constant relationship of the condylar neck to the aforementioned reference plane has not been proven, this three dimensional approach seems to enable the clinician to place the needle in a consistent location and to feel a definite end point before depositing the anesthetic solution.[21] (Figure 3a)

Frequency of aspiration of blood was similar in both Gow-Gates and conventional groups. Near the target zone of the Gow-Gates technic there lie a small accessary meningeal artery and the larger middle meningeal artery posterior to the mandibular nerve trunk.[43] The maxillary vein

may be less than 10 mm. above the lingula and the artery just above this,[33] but this height is somewhat inferior for needle puncture during use of the Gow-Gates technic. Moreover, the target zone for the deposition of the solution is reportedly relatively avascular.[20] However, Barker[4] indicates that the maxillary artery enters the pterygomandibular space through the interpterygoid fascia and initially lies in close relation to the neck of the condyle.

Robertson[37] reported a positive aspiration rate of 17% when utilizing the Gow-Gates technic as compared with a much lower rate of 2% in his standard injection group. He considered that the pterygoid venous plexus is most often the source of positive blood aspiration with the Gow-Gates technic. Barker[4] described that the pterygoid plexus of veins surrounds the inferior head of the lateral pterygoid muscle and is confluent posteriorly with a plexus surrounding the capsule of the temporomandibular joint. The present study did not reveal any difference between two groups but was different than preceding studies in the patient population (children and adolescents). Also both study groups were relatively small.

Gow-Gates[20] claims that the onset of anesthesia is more rapid with his technic because the anesthetic solution bathes the mandibular nerve and its branches within the confines of the interpterygoid fascial pouch. He reported[21] that restorative procedures could be commenced in the molar region within 4 minutes but that anterior teeth required a slightly longer time for analgesia.

Without the actual data it is not possible to compare our findings with his, but we were not able to demonstrate significant differences in speed of onset between the Gow-Gates and standard anesthetic technic group.

## SUMMARY

1. A Gow-Gates mandibular block injection was given to 11 pedodontic patients. The results were compared with eleven pedodontic patients who had a conventional inferior alveolar, lingual, and buccal nerve blocks.
2. The Gow-Gates group exhibited clinically excellent anesthesia in 100% of the cases. In the conventional group, clinically excellent anesthesia was achieved in 72.7% of the cases. Nine point one percent was usable and 18.2% of the patients required supplemental injections to complete the treatment.
3. The rate of positive pain response on insertion and/or injection was much smaller in the Gow-Gates group than the conventional group. The major difference in children or adolescents, however, was thought to come from a positive response to separate buccal injections. A difference in pain response between the high puncture point of the Gow-Gates technic and a lower puncutre point of a conventional technic was not clearly demonstrated.
4. An equal frequency of blood aspiration was seen in both the Gow-Gates and conventional technic.
5. The clinical efficacy of the Gow-Gates technic on pedodontic patients was demonstrated.

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Gow-Gates Group

| Criteria | Case Number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aspiration | - | - | - | - | - | - | - | - | + | - | - |
| Speed of onset (min.) | 5 | 1 | 1 | 1½ | 1½ | 1½ | 2½ | 2½ | 1 | 3 | 1½ |
| Grade of anesthesia | A | A | A | A | A | A | A | A | A | A | A |
| Time started (min.) | 6½ | 20 | 9½ | 5½ | 5½ | 5 | 9 | 7 | 7 | 6 | 5 |
| Pain response[1] | - | - | - | - | ± | ± | - | - | ± | - | ± |
| Procedure[2] | Op | Op | Ex | Ex | Op | Op | Op | Op | Op | Op | Op |
| Site (tooth number) | 19 | 30 | 28 | 21 | K | R/S | 18/19 | 30/31 | 18 | 19 | 30 |
| Time finished (min.) | 60 | 40 | 15 | 15 | 30 | 45 | 60 | 75 | 45 | 30 | 15 |
| Reaction | - | - | - | - | - | - | - | - | - | - | - |
| Age (year/month) | 11/2 | 11/1 | 9/0 | 9/1 | 4/0 | 4/0 | 15/7 | 15/7 | 16/4 | 11/1 | 10/1 |
| Sex (male/female) | m | f | m | m | f | f | m | m | m | m | f |
| General health[3] | I | I | I | I | I | I | I | I | I | I | I |
| Anesthetic (ml.) | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |

[1] + moderate to severe, ± mild discomfort, - pain-free

[2] Op:operative, Ex:extraction

[3] I:A patient without systemic disease; a normal healthy patient
II:A patient with mild systemic disease

Conventional Group

Case Number

| Criteria | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aspiration | - | - | - | - | - | - | - | + | - | - | - |
| Speed of onset (min.) | 3 | 3 | 2 | 2½ | 2 | 3½ | ½ | 1½ | 4 | 1 | 1½ |
| Grade of anesthesia | A | A | C | A | A | A | B | C | A | A | A |
| Time started (min.) | 5 | 8 | 10 | 6½ | 6 | 9 | 8 | 5 | 6 | 5 | 4 |
| Pain response[1] | + | ± | ± | + | - | ± | + | ± | ± | ± | + |
| Procedure[2] | Op | Cr | Cr | Op | Op | Op | Op | Op | Op | Op | Op |
| Site (tooth number) | T | L | 19 | 31 | S/T | 19 | 19 | 29/30 | L | K | L |
| Time finished (m9n.) | 60 | 60 | 40 | 45 | 45 | 30 | 30 | 60 | 30 | 30 | 30 |
| Reaction | - | - | - | - | - | - | - | - | - | - | - |
| Age (year/month) | 6/11 | 5/10 | 7/1 | 14/1 | 8/5 | 7/9 | 6/6 | 16/4 | 8/5 | 8/11 | 7/9 |
| Sex (male/female) | m | f | m | f | m | m | f | m | m | f | f |
| General health[3] | I | II | II | II | I | I | I | I | I | I | I |
| Anesthetic (ml.) | 1.8 | 1.8 | 2.5 | 1.8 | 1.8 | 1.8 | 1.8 | 2.7 | 1.8 | 1.8 | 1.8 |

[1] + significant, ± mild discomfort, - pain-free

[2] Op: operative, Cr: stainless steel crown

[3] I: A patient without systemic disease; a normal healthy patient
II: A patient with mild systemic disease