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Puncture in the canine fossa: technique and pros and cons

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SUMMARY

The authors describe in detail the technique they are employing for puncturing the canine fossa, for irrigation, sinuscopy and/or register of the antral pressures. Two trocars are introduced, one developed and the other modified by one of the authors (N.P.). A morbid entity named "glue-sinus" is commented. The pros and cons of the technique are discussed concluding that puncture in the canine fossa is a valid procedure and even more advantageous than the one in the nasal inferior meatus.

In 1975, one of us (N.P.) received as a gift, from Maurice Cottle (Chicago) a modified Wolf's needle. In the box, together with drawings and instructions in his own handwriting, there was a suggestion to try it in the puncture of the canine fossa. The suggestion was accepted and the goal of this paper is to present how we perform this procedure and its advantages and disadvantages compared to the popular puncture in the nasal inferior meatus, according to the experience we have been accumulating since 1975.

TECHNIQUE

A. *Anesthesia*

In order to get a good anesthesia of the canine fossa and of the sinus mucosa, the following nerves must be blocked: (a) the infra-orbitary nerve and the superior anterior alveolar branches, (b) the superior posterior alveolar branches and (c) the superior gingival rami (from the alveolar plexus). As a rule, two cubic centimeters of 2% bupivacaine with norepinephrine are enough. When a patient complains about pain after the penetration of the trocar it indicates that the superior alveolar branches have not been conveniently blocked. The previous use of topic anesthesia in the region to be infiltrated seems superfluous to us and increases the toxicity of the anesthesia.

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B. *Introduction of the trocar*

There is no problem to reach the sinus cavity for someone who has a good knowledge of the anatomy of the region. The usual landmark is the second superior bicuspid. As a rule we puncture a point sited more than two centimeters above its gingival margin and at least one centimeter below the inferior orbital rim. The canine fossa includes this site and there the bone is generally thin, with scarce vases and no nerves. But this area is surrounded by thick bone (well vascularized and difficult to be transpierced) and structures which should not be damaged, as nerves and dental roots. Through the classical Black's table (apud Wheeler, 1974) (Table 1), we verify that the biggest dental root (from the first bicuspid to the first molar) measures less than 20 mm. That is the reason why a minimal distance of 20 mm is usually observed in order to preserve the dental root and the superjacent alveolar plexus. In order to have a better knowledge of the region, if necessary, we may have a supplementary X-ray study of the region, with odontologic film (besides the routinary and compulsory four incidences for sudying the paranasal sinuses). It is interesting to remind a practical rule: a dental root will seldom measure more than twice the height of its crown. According the Black's measurements (Table 1) we realize that this rule has almost no exception.

Table 1. Excerpt of some pertinent data from the Black's table about measurements of the teeth

Table of measurements of the teeth of man, given in milimeters and tenths of milimeters		length over all	length of crown	length of root
cuspid	average	26.5	9.5	17.3
	greatest	32.0	12.0	20.5
	least	20.0	8.0	11.0
1st bicuspid	average	20.6	8.2	12.4
	greatest	22.5	9.0	14.0
	least	17.0	7.0	10.0
2nd bicuspid	average	21.5	7.5	14.0
	greatest	27.0	9.0	19.0
	least	16.0	7.0	10.0
1st molar	average	20.8	7.7	13.2
	greatest	24.0	9.0	16.0
	least	17.0	7.0	10.0

C. *Instrumental*

In the beginning we have employed the Wolf's needle, to which Cottle had added a bumper (guard) able to limit its introduction to 18 mm (Figure 1-A). This way he practically prevents damaging of the roof, the posterior wall and the floor of the sinus cavity, as a consequence of an unfortunate or intempestive manoeuvre.

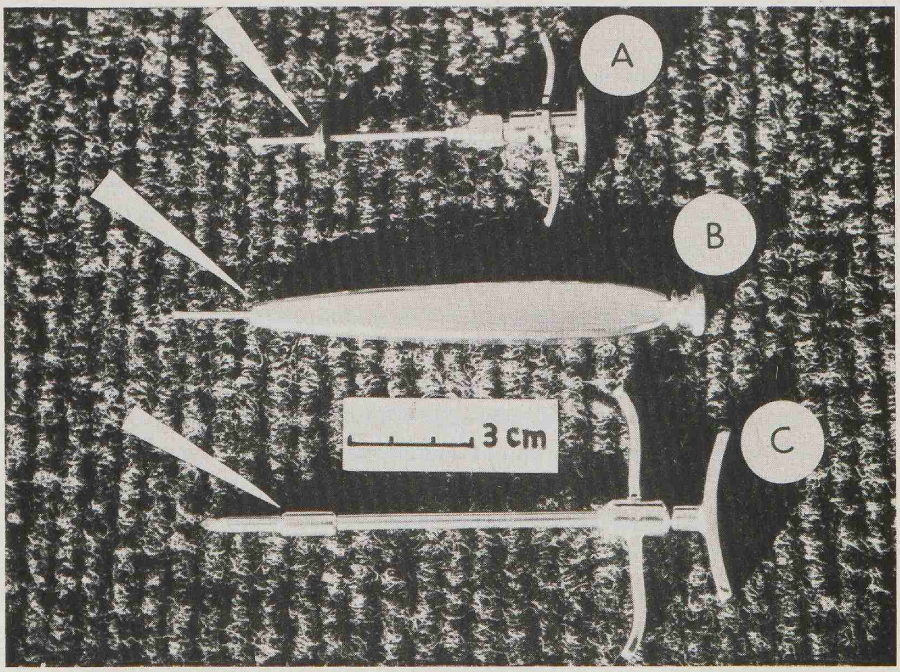

Figure 1. (A) The Wolf's trocar modified by Cottle, (B) the Neves-Pinto's trocar and (C) the trocar of Lang and Sons modified by Neves-Pinto.

Nevertheless we should not dispense the previous X-ray study of the region. On the other hand, the trocar has to be introduced in an imaginary plan, parallel to the orbital floor and slightly obliquous, in the anterior-posterior sense, in the direction of the maxillary tuberosity. Petersen (1973) punctures with a spinal needle no. 18 and Ritter (1977) with a Lichtwitz trocar. They are introduced with the help of a hammer or a hand blow. Nowadays, in order to avoid the negative psychological repercussion on the part of the patient caused by such manoeuvres with a hammer or hand blows (although they are painless) and to make the puncture more comfortable for the performer also, one of us (N.P.) developed a trocar (Figure 1-B) which, like the ones of Wolf/Cottle, presents a bumper to improve safety. But a more convenient handle and the tip with a bevel (Wolf/Cottle's needle tip is conic) allow a gentle introduction through the bone, as if it were a drill, without the need of helping with a hammer or hand blows. Such instrument has turned out to be so comfortable (at least in our hands) that it is distressing for us to use eventually our "old" Wolf/Cottle's needle.

D. *The test of ostium permeability*

The trocar having been introduced, the mandril is taken out and a dischargeable

syringe of 20 cm^3 is attached to the posterior extremity of its handle. Afterwards, we can "feel" whether we are really inside the sinus and try the permeability of the ostium. When the ostium is not transposed by the air column pushed by the syringe, we are either in the presence of a blocked ostium, out of the sinus cavity or we are imerged in anomalous tissue that has invaded it. Such manoeuvres have always to be performed gently in order to avoid an air embolism (Bacher, 1923). Observing the draining of the washing liquid through the posterior extremity of the trocar we can get important data about the permeability of the ostium. When it is blocked no draining will be observed. When it is completely open it will drop freely. Between the two extremes, we find intermediate situations representing blockages of greater or lesser clinical significance. When a two channels rhinomanometer is available we can get simultaneous pressure curves from the sinus and ipsolateral nasal fossa. These curves are similar in the normal cases (Cottle, 1968, 1976) and will provide valuable information about the sinus ostium permeability in a completely safe way (we use two Cottle's rhinomanometers PF-102). Exceptionally, when it is not transposed by a moderate pressure of physiologic serum, we perform a second puncture, this time in the inferior meatus, in order to create a second hole to drain the liquid employed for the sinus washing.

E. *Complementary measures and care*

Mainly in pusillanimous patients we have been recommanding the use of a tranquilizer medicine (benzodiazepinics, for instance) in the 24 hours before surgery. The ideal would be that the patient came to surgery on an empty stomach for at least four hours. After the washing, with or without a sample collection for culture and antibiogram, we introduce in the sinus cavity 5 cm^3 of a 0.5% ephedrine solution for hemosthasis reinforcement, and afterwards an antibiotic also. Washing is done with warm physiological serum. In the same occasion, we make an intramuscular injection of 4 mg of dexametazone, in order to avoid a possible edema produced by the anesthetic infiltration and the surgical manipulation. It is advisable that the patient doesn't blow out the nose for 24/48 hours after puncture as a prophylaxis of an eventual emphysema of the soft tissues of the region. However, he is free to blow in his nose.

F. *Puncture in children*

Even in less than 12 years old patients, puncture through canine fossa is possible as Logan and Kronfeld's table (apud Wheeler) shows (Table 2). In these cases a meticulous X-ray study will show us the empty espace to be punctured. However, these patients will hardly permit a puncture under local anesthesia and we prefer to perform an antrostomy, with an electric burr and general anesthesia.

Table 2 Excerpt of some pertinent data from the Logan and Kronfeld's table about chronology of the dentition

cuspid	11–12 years
1st bicuspid	10–11 years
2nd bicuspid	10–12 years
1st molar	6– 7 years

G. *Incompetence of the ostium and "glue-sinus"*

We call the attention on two pathologies frequently associated: the incompetence of the maxillary sinus ostium, whose importance has been emphasized by Cottle (1968, 1976), and the presence of thick mucous secretion, esterile and absolutely transparent. It would be the result of a pathology homologous to the known "glue-ear" and we have been calling it "glue-sinus". Clinically it would correspond to the cases of posterior discharge which are just solved after puncture and washing of the maxillary sinus. It may be unnoticed for its transparence is identical to the one of the physiologic serus employed in the washing.

H. *Sinuscopy*

When we intend to perform a sinuscopy also, we use a trocar substantially thicker than the ones previously quoted: the trocar of Lang and Sons, for the sternal bone marrow biopsy, which allows us the introduction of telescopes illuminated through optical fibers, suction tips or surgical instruments (a biopsy forceps, for instance). To this trocar one of us (N.P.) added a bumper able to limit its penetration to 18 mm (for the reason already quoted). Figure 1-C).

ADVANTAGES OF PUNCTURE IN THE CANINE FOSSA

A. *In the anesthesia*

In order to perform a puncture in the canine fossa (PCF) we use an anesthesia by infiltration which is more efficient, quicker and less toxic. It dispenses any previous topic anesthesia and after three minutes, including the time expended for the anesthetic infiltration, we can begin the PCF. For the puncture in the inferior meatus (PIM) just employing a topic anesthesia or, for a greater efficiency, a topic anesthesia plus a posterior anesthetic infiltration of the region, at least 15 minutes are needed. In PCF the blockage of the nerves to obtain a perfect anesthesia of the region is always attainable. In PIM anatomic peculiarities (e.g.: meaningful septal deformities and exiguous inferior meatuses) may difficult or even prevent this kind of anesthesia. In PIM the sinus mucosa isn't anesthetized and this facilitates the excitation of reflexes and undesirable sensation, during the irrigation. In PCF the sinus mucosa is conveniently anesthetized after the blockage of the superior

posterior alveolar nervus rami and a pain sensation will only be elicited in cases of greater or lesser blockage of the ostium. This information will have a clinical value.

B. *In the introduction of the trocar*

In PCF the trocar can be introduced more or less perpendicularly to the anterior wall of the sinus and, almost always, through the thin and scarcely vascularized bone. This makes its introduction easier and gentler, without fractures or lacerations, practically eliminating the possibility of a meaningful haemorrhage. In PIM, particularly when an straight trocar is used, the wall to be transfixed is reached in a very obliquous angle. Specially in cases where it is very thick, two unpleasant eventualities can occur, both able to produce a copious haemorrhagia: (a) the trocar reaches the bone in such an obliquous way that it will be impossible to introduce it as a dril and the force of a hand blow will be required sometimes resulting in a bone wall fracture with laceration of the nasal mucosa; (b) the trocar can slip over the bone without piercing it and lacerating the nasal mucous membrane. The psychic repercussion of these accidents is desastrous and the patient will hardly agree to try a puncture again. In PCF, specially when employing trocars provided with a bumper limiting its penetration it will be almost impossible, if dealing with reasonably developed sinuses, to reach the posterior wall, the roof or the floor of the maxillary sinus. Through this via, the surgeon can "feel" better where the tip of the introduced trocar is. In PIM the obliquity of penetration of the trocar makes the orbital floor and even the eyeball vulnerable. A straight trocar provided with a bumper would sensibly diminish such risk, even in unexpert hand. A lesion of the nasal ostium of the naso-lacrimal duct and trauma of the cartilaginous nasal septum can also occur. A curved trocar is safer, however there will be a possibility of transfixing the anterior or the posterior wall of the sinus and the use of telescopes would obviously be impossible.

C. *In the instrumental*

The use of a bumper limiting the penetration of the trocar increases by far the safety of the manoeuvre. Bumpers don't cause any problem when puncturing through the canine fossa. But in PIM the use of a trocar provided with a bumper, can difficult or even prevent its penetration in the nasal meatus.

D. *Testing the permeability of the ostium*

Because it leaves the nasal fossa free and mainly because it doesn't distort the lobule (Cottle's areas 1 and 2) the PCF will make possible the attainment of more realistic simultaneous pressure curves of the antrum and nasal fossa.

E. *In children's puncture*
According to Ritter (1976) PCF would be the only safe via when dealing with the poor developed maxillary sinus cavity of children. But this is a controverted matter. Terrier (1978), for instance, thinks that PIM should be the choosen via. We like antrostomy better, employing an electric burr (see "Technique").

F. *In sinuscopy*
In PCF, placing the trocar correctly, we will perform a valid sinuscopy using just a zero degrees telescope (just the anterior wall of the sinus won't be visible) and a complete inspection adding a 120 degrees telescope. In PIM, due to the obliquity of the trocar, in order to obtain a valid sinuscopy we will have to use both of these telescopes and to add a 70 degrees one to inspect the sinus cavity completely. The thinner telescope is the 2.7 mm (Storz-Hopkins) and just the ones of zero and thirty degrees are available. It means that it is useful only for sinuscopies via canine fossa. We remind, as Terrier (1978) stresses, that none sinuscopy is valid if we can't visualize the ostium of the maxillary sinus.

G. *Under the psychological point of view*
We can assure, and any colleague can check it asking to patients already submitted to a PIM before, that a PCF is by far easier to be tolerated and we have had no difficulty to repeat it in the same patient.

DISADVANTAGES OF PUNCTURE IN CANINE FOSSA

A. *Possibility of lesion of dental root, a dental germe and nervous fibers*
The lesion of a dental germe will only be possible if puncture is performed in a less than 12 years old patient (Table 2). Precautions that should be taken when dealing with children are described in "Technique". A lesion of a dental root seems impossible to us and the lesion of a nervous fiber seems unlikely to happen if we take the necessary precautions (see "Technique").

B. *Possibility of tumefaction of the region by edema and/or emphysema*
They may be avoided if we follow the instructions already described in "Technique".

C. *Possibility of a sinus fistula*
In more than 600 punctures performed we have never observed a sinus fistula as a consequence of such manoeuvre but we have to admit such possibility if we are using a trocar with a broader bore in order to permit sinuscopies with the 4 mm telescopes. As prophylaxis we think it would be enough to observe the same precautions already described for avoiding a tumefaction of the region (see "Technique").

D. *Impossibility of placing a draining tube for posterior washing, without the necessity of another puncture*

It is a small but real disadvantage. We perform just from one to three punctures in a same patient, with one week intervals. There is no problem in repeating a PCF, neither for the patient nor for the doctor. Very often we are able to use the same hole already made in the last puncture. On the other hand, the presence of a draining tube inside the nasal fossa produces some annoyance to the patient also.

RÉSUMÉ

Après la description detaillée de la technique ils employent pour faire la ponction dans la fossa canine (PFC) pour la irrigation, la endoscopie et/or le registre de les pressions du sinus maxillaire, les auteurs presentent les avantages et désavantages de cette technique en la comparant avec la populaire ponction faite dans le méat inferieur (PMI). Ils conclurent que la PFC est valable et même plus avantageuse que la PMI. Deux trocarts pour la PFC sont descrites une entitée clinique est commentée ("glue sinus").

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