

Peribulbar Blockade double injection technique: Comparison of different Needle length

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Citation

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Abstract

Purpose: The aim of this study is to compare the efficacy of using a 15 mm needle with the “standard” 25 mm needle in double injection peribulbar block technique.

Methods: This is a retrospective study in which 528 patient records we studied. Patients were divided in two groups, group (1) in which the anesthesiologist used a 25mm needle while in group (2) a 15mm needle length was used. Recorded simple akinesia score was used as a tool to determine the efficacy of the block. Supplementation rates as well as complications were also retrieved.

Results: Acceptable akinesia after the double injection was 90.5% and 89% in group 1 and 2 respectively. Supplementation rate to achieve full akinesia was 25.3% and 25% for group one and two respectively with no statistical significant difference. No local or systemic complications were reported.

Conclusion: Using 15 mm needle length to perform peribulbar block is equally effective a 25 mm needle and theoretically safer practice.

INTRODUCTION

Provision of ophthalmic regional anesthesia varies worldwide. Both akinetic and non-akinetic techniques are used (1). Despite the increase in popularity of sub-Tenon's techniques using a blunt cannula, peribulbar techniques using sharp needles is still accepted and widely practiced in this part of the world. Since the first introduction of the peribulbar block in 1986 by Davis and Mandel (2), many modifications of the techniques were observed. Bloomberg described a technique where the anesthetic solution is deposited more superficially outside the muscle cone, approximately 18 mm from the skin surface. Five ml of anesthetic agent is injected into the supero-nasal orbit and a further 5 ml infero-temporally (3).

Peribulbar anaesthesia is achieved by bulk spread of local anaesthesia. The block is often established using a single or double injection technique (4). In our institute the choice between single or double injection technique is based on the volume of the orbit, degree of akinesia required, experience of the ophthalmologist and preference of the anesthesiologist

.For dual injection technique; the most popular site for the first injection is the infero-temporal site, the classical site for the second injection is supero-medial (5).

Needle length is an important consideration in the safe conduct of ophthalmic blocks. Atkinson described the use of a 35mm needle length in performing the retrobulbar block (6). While Davis and Mandel described the peribulbar block using 27.5mm long needle (2). It is now common practice to use 25mm needles to administer peribulbar block (3). Some authors had demonstrated excellent results with 16mm needle (7). Shorter needles may reduce the needle related complications. Shorter needles, 25mm or less, are likely to reduce the risk of damage to nerves, vessels & muscles deep to the globe (8). Optic nerve penetration and brainstem anesthesia are usually associated with needles 35 mm or longer (5).

The aim of this study is to compare the efficacy of using a 15 mm needle with the “standard” 25 mm needle in double injection peribulbar block technique involving an infero-temporal and a supero-nasal injection site.

METHOD

After approval of the hospital's research and human ethics committees, data was collected retrospectively by reviewing 528 patient records. Patients were divided in two groups of 264 each. Group (1) in which the anesthesiologist used a 25mm needle while in group (2) a 15mm needle length was used. All needles are sharp and of 25 gauge. All adult patients who underwent any cataract or glaucoma procedure were included in this study.

The peribulbar block double injection technique commonly performed at King Khaled Eye Specialist Hospital (KKESH) involves an infero-temporal and a supero-medial injection. The injection site of the inferior injection is lateral to the junction of medial two-thirds and lateral one-third. With the patient's eye in the neutral position, the needle is directed perpendicular to the skin then redirected slightly medial and upward by 15-20 degree to avoid the lateral orbital wall. After negative aspiration up to 10 ml of local anesthetic solution is injected. The supero-medial injection site is also lateral to the classical 2.30 clock face site (right orbit) and is situated at a 1:00 to 1:30 clock face site. The needle is directed over the globe and straight back once over the equator. Between 3-5ml of local anesthesia is deposited outside the muscle cone. The anesthetic solution used is a mixture of lignocaine 2%, bupivacaine 0.5% without epinephrine, in 2:3 volume mixes with 5 IU/ml hyaluronidase. A Honan-cuff pressure reducing device is applied and inflated.

A simple akinesia score originally described by Crawford is used for assessment of the block (9). Eye movement in four directions is assessed – inferior, superior, medial and lateral. Normal movement is scored at 2 and reduced movement at 1 and flickering movement or akinesia is scored at zero. Assessment was done after 10 minutes for all patients because it is the maximum fixation time for the mixture of local anesthesia used. The sites of supplementary injections are supero-medial for superior or medial movement and infero-temporal for inferior or lateral movement. All supplements were given by the same type of needle which was used for the primary injection. Note that in our department we often attempt to achieve total akinesia to assist the teaching of surgical techniques to ophthalmology residents. A score of three out of eight which is often accepted elsewhere, is seldom acceptable except for phacoemulsification in experienced hands in our institution.

The sample size of the study group was calculated using N-

Quary software version 4, based on $\alpha=0.05$, equivalence rate $=0.2$, Akinesia was achieved in 77% of patients using a 25mm needle (10) and 81 % success rate for our pilot study using 15mm needle. The results were analyzed using Epi Info software for window version 3.3. Two-sample t-test was used to compare the age, weight, duration of surgery and other normally distributed data. Nominal data and proportions were compared with Chi-squared analysis. A P value <0.05 was considered significant.

RESULTS

Five hundred and twenty eight patients were enrolled in this study. Demographic and clinical data are shown in Table 1. The two test groups were comparable for height, weight, sex, operated eye, axial length and frequency of staphyloma. There was a statistically significant difference between the two groups as regard the age. Duration of surgery was also different statistically between group (1) and group (2).

The volume of local anesthesia injected, supplementation rate and acceptable akinesia by the surgeon are shown in table (2 and 3) respectively. The volume of the primary infero-lateral injection was statistically greater with 15mm needle group while the volume of local anesthetic injected through the supero-medial approach was statistically higher with 25 mm group (P value <0.05). Total volume of the injected local anesthesia after supplementation was statistically higher with 15 mm group (P value <0.05). Acceptable akinesia after the double injection (score 3 or less) was 90.5% and 89% in group 1 and 2 respectively. Supplementation rate to achieve full akinesia was 25.3% and 25% for group one and two respectively with no statistical significant difference. There were no cases of globe perforation, retrobulbar hemorrhage, central spread, optic or retinal damage, rectus muscle paresis, orbital hematoma and lid hemorrhage in both groups. No major life threatening complications were recorded.

Figure 1

Table 1: Demographic and clinical data

| | Group 1 (25mm) Mean (SD) | Group 2 (15mm) Mean (SD) |
|-----------------------------|-----------------------------|-----------------------------|
| Age (years) | 64.3 (12.6) | 61.3 (14.4)* |
| Height (cm) | 157.8 (9.5) | 159.1 (9.5) |
| Weight (kg) | 73.5 (15.7) | 72.9 (15.6) |
| Axial length | 23.49 (1.9) | 23.73 (1.8) |
| Duration of Surgery (min) | 47.5 (22.4) | 41.6 (23)* |
| Frequency of Staphyloma (%) | 27 (10.3%) | 29 (11%) |

*P value <0.05

Data are expressed as mean and standard deviation while presence of staphyloma is expressed as percentage in relation to the number of patients.

Figure 2

Table 2: Volume of local anesthesia injected:

| | Group 1(25mm) (N= 264) | Group 2 (15mm) (N= 264) |
|------------------------------|---------------------------|----------------------------|
| Initial Volume injected (ML) | | |
| Infero-lateral | 9.1(1.5) | 9.8 (0.4)* |
| Supero-medial | 5.3 (2.2)* | 5.06 (0.9) |
| Total | 14.4 (3.2) | 14.9 (1.1)* |
| Total volume injected (ML) | 16 (4.6) | 16.9 (4.2)* |

Data expressed as a mean value and standard deviation. * P value < 0.05

Figure 3

Table 3: supplementation rate and akinesia score:

| | Group 1(25mm) (N= 264) | Group 2 (15mm) (N= 264) |
|--|---------------------------|----------------------------|
| No. of patients requiring supplementary injection | 67 (25.3%) | 66 (25%) |
| Acceptable akinesia after double injection (Score 3 or less) | 238(90.5%) | 235(89%) |
| Full akinesia after supplementation | 264(100%) | 264(100%) |

Data expressed as number and percentages.

DISCUSSION

The results of this study showed that the use of a 15mm needle gives a comparable result to a 25mm needle in term

of akinesia and supplementation rate. Scott and colleagues (7) demonstrated that a 16mm needle reaches to the vicinity of the orbital equator and cannot pass beyond it, while the longer needle of 25mm may be advanced beyond this area into the more dangerous retrobulbar space and may also pass into the inferior orbital floor reducing the spread of local anesthetic around the globe itself. Gills et al (12) divide the orbit into three spaces (anterior, mid and posterior) for better appreciation of the relationship of injection site. The anterior orbit ends 2-5 mm anterior to the equator of the globe and is filled primarily with connective tissue while the mid- orbit ends posteriorly about 10-12 mm behind the posterior surface of the globe. It contains primarily muscle bellies and adipo-connective tissue. Insertion of longer needles deep into the orbit increases the potential of injury to important structures and that limitation of the depth of needle insertion may limit needle injury (12). Hamilton demonstrated that a needle longer than 31 mm increased the risk of direct injection into the subarachnoid space and injury to the optic nerve (13).

Since ocular akinesia is accepted as an indication of ocular analgesia it is used in this study to assess efficacy. A further indicator of efficacy of the block is the requirement of supplementary injection. This is convenient as the expectation of most of our junior ophthalmology staff in our teaching hospital is akinesia. For experienced ophthalmologist performing phacoemulsification, akinesia is not required and topical anesthesia is often required. Our targeted end point was achieved in 90.5% and 89% with 25 and 15 mm needle length respectively. The data published previously from our hospital demonstrated a success rate of 66% and 36% of primary double injections for 25 and 15 mm needle length respectively (4). Although the results, with respect of akinesia achieved in the current work with the primary injection was often considered acceptable by most standards, a second injection was often performed to assure the expected degree of akinesia. The reported supplementation rate varies worldwide from 5-63% (14, 15). The supplementation rate of the current study was 25.3% and 25% for 25 and 15 mm needle length. This is in contrast to the Van den Berg study that showed a supplementation rate of 44% and 64% for 25 and 15 mm needles (4). The same mixture of local anesthetic used for both studies. We attribute the improved result with shorter needles not only to the growing experience of all anesthesiologist in our department with 25 mm (long- established experience) and now the 15 mm needle but also to tolerance of the operating surgeon to the eye movement due to improvement of the

surgical techniques. Budd and his colleagues (₁₆) reported Akinesia of 79% with 25 G, 25 mm needle in a double injection technique involving inferotemporal and medial approaches. Our results are in agreement with Rizzo et al (₁₇) who demonstrated 78.6% of patients had a motor block of more than 80% after 5 min and after 7 min 100% of patients had adequate anesthesia to proceed with and complete the surgery using 16 mm needle with infero-medial approach. Scott and colleagues (₇) demonstrated effective results with a 16 mm needle and attributed their success to effective anatomic placement within the orbit allowing access to the retrobulbar space via fascial septae.

The total volume of local anesthetic injected in our 15 mm needle group was statistically significantly higher compared to the 25 mm group (14.4 vs 14.9 ml) and after a supplementary injection (16 vs 16.9 ml). Clinically the difference appears small. The difference between the two groups could be attributed to the more anterior placement of the local anesthetics and the longer distance the injectate needs to travel to reach its target nerves. In consistent with our opinion, Ripart et al (₁₈) who demonstrated that local anesthetic injected extraconally has longer way to spread into the cone to block all nerves responsible of the sensory, motor and autonomic innervations of the eyeball and increasing the volume injected is a mean of compensating for this need for more spreading. Gillart and his colleagues (₁₉) demonstrated that the use of large volume (13.5) improves the quality of akinesia. The relatively large volumes of injectate are consistent with previous work from our institute (₄) and in contrast to the small volume used by single injection techniques (_{17, 20}). We attribute our increased volume to the need for akinesia and also to our technique which is strictly periconal. Moreover, Frow et al (₉) attributed the larger volume used in his work by titration of injected solution to the total upper eyelid drop as an end-point marker to determine the success of the block in an individual patient. Fullness and upper eyelid dropping is commonly used methods in our institute to determine the desired volume of local anesthetics.

In conclusion: our experience with 15 mm needle length to perform peribulbar block using infero-temporal and a supero-medial double injection technique showed a comparable results with 25 mm needle. The technique is effective and theoretically safer.

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