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Experience with the 29G Quincke needle in 1,254 young patients non-obstetric - A retrospective study

Abstract

Background and objectives: A technique for spinal anesthesia in which a subarachnoid tap is done with a needle whose cutting tip is 29G is described. The method was used in 1,254 young patients. The objective of this retrospective study was to evaluate the success, difficulties, and incidence of complications using a 29G Quincke-type needle without an introducer.

Methods: Various types of surgery were performed with isobaric and hyperbaric local anesthetics in 1,254 non-obstetric young patients using a 29G Quincke needle. Difficulty in localizing the space and time taken to administer spinal anesthesia were noted. Post-operatively, the incidence and severity of headache, backache, and any auditory symptoms were recorded. Patient satisfaction was assessed by telephone in the postoperative period after hospital discharge.

Results: Patients of both sexes, under 50 years of age, from various surgical specialties, underwent spinal anesthesia with a 29G Quincke needle without an introducer, punctured between L2 and L4, inserted via the median (4%) and paramedian approaches (96%), with punctured in the lateral decubitus position (96%) and median (4%). PDPH occurred in only three patients (0.2%) and showed no correlation with the number of attempts. The puncture position was lateral decubitus and seated; similarly, the paramedian and median insertion positions were not studied for correlation with PDPH. There were 40 (3.1%) failures, justified by surgical time.

Conclusion: The appearance of PDPH did not disappear with the 29G needle, however all three were mild and responded to clinical treatment, without the need for a blood patch. No neurological complications occurred. All patients evaluated after hospital discharge were very satisfied with the technique.

Keywords: needle, spinal, regional, spinal, headache, backache, needle bending

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Introduction

In 1975, spinal anesthesia needles were all reusable (Figure 1). From 1988 onwards, disposable needles became part of the material used in spinal anesthesia in Brazil, initially cutting needles (Quincke) and later pencil-point needles (Whitacre) and finally Huber-point needles (Atraucan), having carried out several studies with different gauges and different needle designs.[1] And all the hospitals stopped using reused needles and adopted disposable needles.

Figure 1 Metal and reused needles.

Post-dural puncture headache (PDPH) is a constant concern, ever since the first spinal anesthesia performed by Bier and his assistant Hildebrandt. A 29G (≈0.33 - 0.35 mm diameter) Quincke spinal needle is a fine-gauge, cutting-tip needle used for access to the subarachnoid space during spinal anesthesia puncture, especially in young patients. Several studies with young patients have shown a low incidence of PDPH, no (0%) PDPH,[2–4] 2%[5] and 4%,[6] several difficulties have been demonstrated in its handling. Studying 5,050 non-obstetric patients using 25G, 26G, 27G, or 29G Quincke; 26G Atraucan or 27G Whitacre needles, the lowest incidence of PDPH occurred with the 29G [0.3%] cutting tip needle.[1]

Evaluating the dripping time of the first drop of cerebrospinal fluid (CSF) using 25G, 27G, and 29G Quincke needles showed that the average time with the 29G needle (84 seconds) was significantly longer compared to the 25G (24 seconds) and 27G (27 seconds) needles, and no significant difference was observed between the 25G and 27G needles.[7] This assessment of the drip time with the 29G Quincke needle was fundamental to predicting this drip time in the present retrospective study.

The use of extremely fine spinal needles such as 29G may be associated with technical problems during their use.[8,9] In 1969 a 32G needle was constructed and used on 500 patients.[10] The needle consisted of two fused portions, the shorter portion being a 21G needle and the longer portion, which corresponds to the tip, having a 32G and 33G. The success rate in obtaining spinal anesthesia was 99.2%. However, according to the available literature, this needle

never became commercially available for use in spinal anesthesia. It should be noted that a 32G can pass through a 26G.

A recent study was published in 812 non-obstetric patients using a 29G pencil-point needle, resulting in a success rate close to 100% and no cases of PDPH were observed.[11] The average time for obtaining CSF with a 29G pencil-point needle was 86.1 seconds, like the study with a 29G Quincke needle.[7] However, the time to obtain CSF can be slow compared to the use of larger gauge needles.

With the arrival of disposable cutting-point needles (25G, 26G, 27G and 29G), the use of these various gauges began and was recorded in a spreadsheet for later study. The aim of this retrospective study was to evaluate the success, difficulties, and incidence of complications using a 29G Quincke-type needle without an introducer in non-obstetric young patients from various specialties and with various local anesthetics.

Methods

This retrospective study was approved by the Institutional Publication Board, and all patients had previously authorized the anonymous use of their clinical data. All non-obstetric young patients (under 50 years old) ASA physical status I and II (American Society of Anesthesiology), several surgical procedures were included in this study.

Following the switch from reprocessed to disposable needles in Brazil, a project was initiated using a spreadsheet from 1988 to 2010 detailing all gauges and tip designs for spinal needles. All young, non-obstetric patients under 50 years of age who were anesthetized with a 29G Quincke needle participated in this retrospective study. During the pre-anesthetic visit the project was detailed, explained to the patient and family, and recorded in an Excel spreadsheet. Because this was a retrospective study, the free and Informed Consent Form was not requested or stored.

In the operating room, after monitoring blood pressure, continuous ECG, and pulse oximetry, intravenous infusion of Ringer's lactate solution was started after venoclysis with a 20G extracath, after local anesthesia with 1 ml of 1% lidocaine and insulin syringe-needle set. Patient data such as age, weight, height, and sex were recorded. Perioperative sedation was performed with fractionated doses of midazolam and fentanyl, sufficient to maintain patient comfort while preserving responsiveness to verbal stimuli.

Lumbar puncture was performed in the L2-L3 or L3-L4 spaces, with patients in the left lateral decubitus or seated position, via the paramedian or median approach. After selecting the lumbar space to be punctured, anesthesia of the tract was initially performed with 1 ml of 1% lidocaine in an insulin syringe and subsequently with 2 ml of the same substance using a 3 ml syringe with 27G intradermal needle. The hole created by the 27G needle was where the 29G Quincke needle was inserted.

All patients were punctured with 29G Quincke disposable needle, without the use of an introducer. The bevel of the cutting needles was inserted parallel to the dural fibers. Correct needle placement was confirmed by the appearance of CSF. Spinal anesthesia was performed with pure (isobaric) local anesthetic solutions or containing glucose (hyperbaric). In all patients, the number of attempts to obtain CSF and subsequently inject the local anesthetic was recorded. Failures (absence of anesthesia or insufficient level) were noted, and a new puncture was performed with another needle of the same type.

To estimate the technical difficulties of using the 29G needle, attempts to obtain CSF without introducer use was evaluated, and after its removal, it was assessed whether the needle had become bent. Similarly, median and paramedian needle insertions were evaluated, as well as insertions in the lateral decubitus or seated positions. The time of appearance of the first drop of CSF was not evaluated. However, the latency of the dermatome used in the puncture of the four anesthetics used was evaluated in several patients. After injecting the various anesthetics, the perineal region was assessed by pricking the needle stylet to determine if the effect was beginning and if there had been any failure.

In the immediate postoperative period, all patients were discharged and encouraged to ambulate as soon as motor function had returned to normal, with proprioception assessed in the first finger of both limbs, and upon clearance from the surgeons. After hospital discharge, patients were instructed to contact anesthesiologist by cell phone if any complications arose. Headache, when present, was assessed by the authors according to the criteria of: mild (no limitation of activity and no need for treatment), moderate (with limitation of activity and use of analgesics, tiapride and caffeine) and severe (confined to bed, inability to stand and use of analgesics, tiapride and caffeine), being treated according to severity. The duration of the headache was also assessed.

After hospital discharge, all patients were contacted by phone to check their satisfaction (very satisfied, satisfied, dissatisfied) and any possible complications. All 1,254 spinal anesthetics performed using the 29G Quincke needle were carried out by professionals participating in the study; it is worth emphasizing that residents or inexperienced anesthesiologists did not participate, This retrospective study did not include an assessment of cardiocirculatory changes, as its objective was to evaluate the 29G cutting-tip needle.

For statistical analysis of the 1,254 patients, the mean plus standard deviation was used; for sex and technical details of the puncture, the number and percentage were used; and for the number of attempts and PDPH, Fisher's exact test was used, with $p<0.05$ considered significant.

Results

The surgeries performed in this study were anorectal surgeries, herniorrhaphy (inguinal and abdominal wall), gynecological, orthopedic, proctological, and urological surgeries. The anthropometric data of the 1,254 non-obstetric patients are in Table 1. Subarachnoid puncture was successful in all patients studied. Upon removing the 29G needle, it was observed that after the CSF failed to appear, it was removed and found to be completely bent and was replaced with another one that successfully punctured the needle.

Table 1 Demographic data (M±SD)

Data	29G = 1,254
Age (yr)	40 ± 16
Weigh (kg)	68 ± 12
Height (cm)	165 ± 10
Gender: M / F	564 (45%) / 690 (55%)

The study did not compare the latency of the different anesthetics used; however, in some patients, the latency was recorded in the anesthesia chart and averaged, obtaining the following results: 2% hyperbaric lidocaine 1:14 min; 2% isobaric lidocaine 1:30 min; 0.5% hyperbaric bupivacaine 1:59 min; and 0.5% isobaric bupivacaine 2:24 min.

The maximum number of attempts to access the subarachnoid space was three or more, 58% of the punctures were successful on

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the first attempt. Most patients were operated on in the left lateral decubitus and paramedian positions. Isobaric and hyperbaric anesthetics, bupivacaine and lidocaine, were used. Failures occurred in 40 patients, mainly due to longer than expected time in choosing the anesthetic and dose used. PDPH occurred in only three patients, classified as mild, with clinical treatment and short duration (Table 2).

Table 2 Details of the anesthetic technique, type of anesthetic, incidence of headache

Details Technique	29G = 1,254
Attempt: (n/%)	
One	728 (58%)
Two	273 (22%)
Three or more	253 (20%)
Paramedian Insertion (n/%)	1204 (96%)
Median Insertion (n/%)	50 (4%)
Insertion Needle: (n/%)	
L2-L3	690 (55%)
L3-L4	564 (45%)
Lateral Decubitus (n/%)	1204 (96%)
Sitting (n/%)	50 (4%)
Isobaric Bupivacaine (n/%)	602 (48%)
Hyperbaric Bupivacaine (n/%)	163 (13%)
Isobaric Lidocaine (n/%)	426 (34%)
Hyperbaric Lidocaine (n/%)	63 (5%)
Failure (n/%)	40 (3.1%)
Post-operative Headache (n/%)	3 (0.2%)

The association between the number of puncture attempts and the incidence of PDPH was assessed using Fisher's exact test, and no statistically significant difference was observed between the number of attempts and the incidence of PDPH ($p = 0.3733$) (Table 3). Because 96% of patients were punctured via the paramedian approach and only 4% via the median approach, it was not possible to correlate this with the incidence of PDPH. Similarly, the incidence of puncture in lateral decubitus (96%) and seated (4%) positions could not be compared in relation to the occurrence of PDPH.

Table 3 Incidence of Headache and Number of Attempts

Attempt	Number	PDPH
att 1	728	1 (0.10%)
att 2	273	1 (0.36%)
att 3	253	1 (0.39%)

att: Attempt; PDPH: Post-dural puncture headache

In only one patient, after the CSF failed to flow, the needle was withdrawn and found to be completely bent (Figure 2). Another puncture was performed with a new 29G Quincke needle, which was successful, and CSF appeared. Back pain was not reported by any patient, just as no transient neurological symptoms were observed in urological patients undergoing lidocaine treatment in the lithotomy position. All patients evaluated after hospital discharge were very satisfied with the technique, due to the light sedation and not feeling the spinal needle prick since they had local anesthesia along the puncture path.

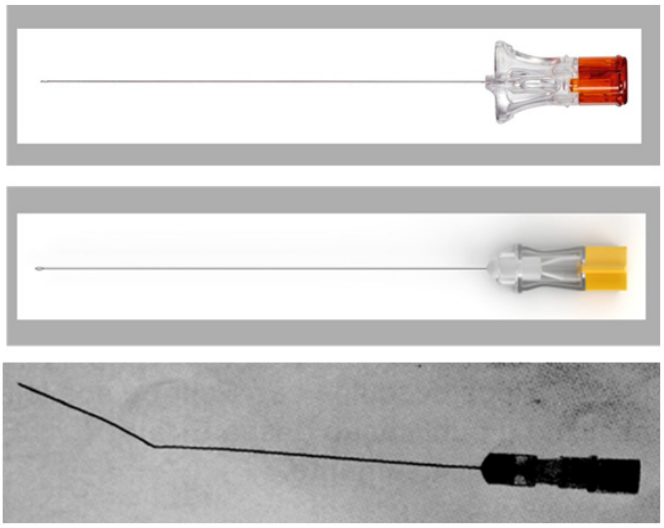

Figure 2 Needle 29G Quincke from two manufacturers in normal condition and after being withdrawn bent after touching the bone.

Discussion

The use of fine-gauge needles like the one in this study (29G Quincke) for subarachnoid puncture has been reported to have technical problems in several studies. In the present study, needle placement in the subarachnoid space was achieved in all 1,254 patients in this study by professionals with more than five years of experience, and there was only one problem with the 29G needle, which, upon touching the bone, was replaced with another one and obtained the CSF, and showed that the needle was completely bent. PDPH occurred after use of a 29G needle Quincke in 3 (0.2%) patients with mild characteristics, and failures occurred in 40 (3.1%) patients, all due to surgical time exceeding the scheduled time. No other complications of clinical interest were observed, nor were any events identified that demonstrated statistical relevance in this study.

The first prospective study conducted on 10,098 spinal anesthesia showed that the incidence of headache decreased when a fine needle was used compared with a large needle.[12] In a prospective study with 326 patients underwent spinal anesthesia for 7 months comparing the influence of needle gauge, needle insertion route and number of puncture attempts with three gauges (25G, 27G, 29G) of sharp-point needles on PDPH.[13] The study results showed that PDPH occurred with all three needles, demonstrating that the possibility of headache cannot be eliminated with fine-gauge needles, according to our study with 1,254 patients. The idea that repeated and unknown punctures in the dura mater may increase the incidence of PDPH was not observed in this study. There was no correlation between the incidence of headache and the needle insertion route.

In 234 adult patients ASA I and II who underwent spinal anesthesia, subarachnoid space depth data were determined using Stocker's weight-based formula, ultrasonography, and actual depth of needle insertion. The average of the three methods was 49.2 mm, 47.7 mm, and 48.1 mm, with no significant difference.[14] Thus, the 29G Quincke needle is 89 mm long, therefore sufficient to reach the CSF of most patients.

Repeated attempts can occur with thin-gauge needles without an introducer due to multiple passes through the skin, supraspinous and interspinous ligaments, and the dense ligamentum flavum increasing resistance, potentially touching the bony part of the vertebral column. In a study with 10,077 patients[15] and another with 1,021 patients,[16] it was demonstrated that repeated subarachnoid punctures increase the incidence of headache. In this study with 1,254 patients punctured with a 29G needle, there is no significant correlation between puncture attempts and the incidence of PDPH, unlike two studies with 11,098 patients.[15,16]

We disagree with the authors' assertion that fine needles reduce the incidence of PDPH, but the mandatory use of a separate introducer needle carries the risk of accidental dural puncture with the introducer.[8] As the technique employed by our research group with the puncture of the 29G cutting-point needle introduced after local anesthesia with lidocaine and insulin syringe and needle, and subsequently with the same substance and 3 ml syringe and 27G needle, the puncture through this local anesthesia easily allowed the introduction of the fine needle, therefore, without the need to use the introducer in all 1,254 young patients. The use of an introducer needle (20G) that accompanies the 29G Quincke needle carries the risk of accidental dural puncture with the introducer, as reported in a case study using the 29G Quincke and 27G Whitacre needle in our group.[2,17]

It has already been explained that although the 29G Quincke needle comes with a 20G introducer, the introducer was not used in these patients. In only one patient, due to the lack of CSF, the needle was removed and found to be completely bent. This does not only happen with the 29G Quincke needle, but was shown with the 27G Quincke needle, where upon removal the needle was broken, leaving a 43 mm fragment in the interspinous ligament of L2-L3, confirmed by fluoroscopy.[18]

Backache is a frequent complaint after spinal and epidural anesthesia. However, neuraxial anesthesia may not be the sole cause. Postanesthesia backache occurs with equal frequency after either spinal (21%) or general anesthesia (19%).[19] In this study conducted via telephone contact, no backache was reported in any of the patients, which can be explained by anesthesia along the needle insertion path and mild sedation.

The 1,254 patients assigned to receive spinal anesthesia with a 29G Quincke needle without the 20G introducer did not experience a significantly higher number of redirections, nor did needle bending occur. The redirections were most likely due to the fine gauge spinal needle bending as it passed through the fibrous spinal ligaments, especially in young and muscular patients.

With the use of the 29G needle Quincke, the local anesthetic was always injected, with only CSF dripping occurring. Spinal anesthesia failed in 3.1% of patients where lidocaine was used, and this failure was attributed to the surgical time involved. Our technique using this needle, even with a 3 ml Louer-Lock syringe, did not result in block failure, as latency and block in the perineal region were verified in all patients.

In a study conducted in 2010 with 1,191 patients, 44 (3.7%) revealed dissatisfaction with spinal anesthesia.[20] The reasons reported were back pain (29.5%), PONV (20.4%), pain at the puncture site (15.9%), inadequate analgesia (13.6%), awareness during the operation (6.8%), PDPH (4.5%), transient neurological symptoms (4.5%), and urinary retention (4.5%). Unfortunately, this study did not report either the needle tip design or the needle gauge. Therefore, it is difficult to make a comparison with this study. In our study with virtually the same number of patients, using a 29G Quincke needle, anesthesia along the needle tract, light sedation, 96% punctured in the lateral decubitus position, and 3 cases of headache, all patients were satisfied with the technique used.

Some studies on satisfaction with spinal anesthesia cite the following: better pain control, lower incidence of nausea and vomiting, faster postoperative recovery, and less need for deep sedation. However, most do not report the gauge and tip design of the needle used.

Conclusion

Patient satisfaction with spinal anesthesia depends on multiple factors, including the quality of the anesthetic block, pain control, communication with the team, intraoperative comfort, occurrence of adverse effects, and postoperative recovery**.** Although PDPH was not eliminated with the 29G Quincke needle, its incidence was extremely low and all cases were mild, self-limited, and successfully treated conservatively, not requiring the use of a blood patch. In our study, we did not encounter any technical difficulties with its use and no correlation with the number of punctures. In only one patient did the needle become bent, requiring us to perform a new puncture. Unlike most anesthesiologists worldwide who prefer to perform spinal anesthesia in a seated position, in this study 96% of patients were anesthetized in the left lateral decubitus position, which can be explained by the lower local cerebrospinal fluid pressure and possible reduction in the initial loss of CSF.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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