

Skin antiseptic solutions for a central neuraxial block. How to do it in daily clinical practice

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Introduction

This year I (LEI) am completing 50 years of graduating in medicine, having specialized in anesthesiology throughout my 50-year journey and intensive therapy for 15 years. From 1980 to 1981, I studied at the Service of Professor Gauthier Lafaye at the Hospices Civil de Strasbourg, having defended a thesis on morphine in the epidural space for analgesia in gynecological surgeries.¹

Since the beginning, I have dedicated myself fully to regional anesthesia, quickly moving from epidural to spinal anesthesia, and through regional blocks with dedication to the implementation of the neurostimulator for its approach and the creation of a Regional Anesthesia Institute, where 450 students from all Brazilian states have passed, and most Latin American countries and two African countries. I started in the profession using reusable metal needles and low-quality local anesthetics.

After an excellent Editorial requesting the Brazilian pharmaceutical company to produce 0.5% bupivacaine for spinal anesthesia,² we began our studies with the hyperbaric bupivacaine³ and isobaric bupivacaine solution.⁴ After a trip to Strasbourg in 1990, I brought the first thin, disposable spinal needles to Brazil, and thus began my first studies on spinal anesthesia with these needles, culminating in an article with 5050 spinal anesthesia, and incidence of post-puncture headache.⁵

Reviewing most spinal anesthesia articles published in Brazil in the 1980s and 1990s, antiseptic material was not described, but the majority used iodinated alcohol. Asepsis is the set of methods and processes for cleaning a given environment, to prevent its contamination by infectious and pathological agents.⁶ Antiseptic is the set of measures used to inhibit the growth of microorganisms or to remove them from a given environment, if they may be destroyed.⁶ The main difference between asepsis and antiseptic is the fact that the latter deals with the disinfection of a location, while the former deals with preventative cleaning.⁶ I experienced all the stages of using antiseptics for spinal anesthesia. So, when I started, I used iodinated alcohol to wash my hands and antiseptic in the patient back to perform the puncture of the subarachnoid space. Iodized alcohol is an antiseptic containing iodine and alcohol, used to clean wounds and prevent infections. However, the use of iodinated alcohol in hospitals was banned because of its adverse effects, such as hypersensitivity, intoxication, and interference with some laboratory tests, however, there is no justification approved by Agência Nacional de Vigilância Sanitária (ANVISA). After this prohibition, I started to use only 70% alcohol, for antiseptic of the hands and cleaning of the back for performing the subarachnoid puncture. Antiseptics most used today for skin antiseptic are alcohols (ethanol, isopropanol and n-propanol), chlorhexidine, commonly available as chlorhexidine gluconate (CHG) and associated with alcohol, and povidone-iodine (PVI), an organic iodine complex applied with a sponge and/or brush, despite from the World Health Organization (WHO) do not recommend the use of brushes for this purpose due to its abrasive effect.⁷ Among these antiseptics, alcohols are microbiologically most active but have no

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appreciable residual activity.⁸ CHG and PVI are less effective, but have residual activity on the skin, which is pronounced for CHG but small for PVI.

Skin antiseptic solutions for central neuraxial block

The anesthesiologist is frequently faced with situations where there is a potential risk of infection cross-cutting, and it is important to recognize and minimize this risk. Simply observing the title of two scientific articles published in important journals dedicated to anesthesiology titled “*You’re not as clean as you think! The role of asepsis in reducing infectious complications related to regional anesthesia*”⁹ and “*Hand washing and disinfection: more than your mother taught you*”¹⁰ may suggest that anesthesiologists have difficulty assimilating and adopting antiseptic practices.

These two truths have been frequently confirmed by me during my 50 years of practicing anesthesiology. Normally, anesthesiologists do not perform antiseptic properly, and never wait for the duration of action of each of the antiseptics they use. No matter how much I teach the method to properly perform antiseptic, they wait for the action time, during the three years of residence in Brazil, immediately after they are unable to follow exactly what was taught.

Alcoholic preparations have been recommended by the WHO, at concentrations between 60 and 80%.⁷ Alcoholic preparations in concentrations between 60 and 95%, as the product of choice for hand hygiene and for antiseptic for neuraxial puncture and surgical site, are justified by their antimicrobial efficacy, ease of application, less damage to the skin and time savings.⁷ Alcoholic preparations in concentrations between 60 and 95%, as the product of choice for hand hygiene and for antiseptic for neuraxial puncture and surgical site, are justified by their antimicrobial efficacy, ease of application, less damage to the skin and time savings (Table 1).^{6,7} Since 2001, alcoholic preparations have been used in Europe for surgical antiseptic of the hands and surgical site.¹¹ In an article from 2010, showing the art of hand and puncture site antiseptic in neuraxial anesthesia, the difference between the use of soap and brush compared to alcoholic solutions was shown (Table 2).¹²

Table 1 Efficiency of different antiseptics

Drugs	Gram +	Gram –	Mycobacteria	Fungi	Virus	Action
Alcohol 70%	+++	+++	+++	+++	+++	Rapid
Chlorhexidine	+++	++	+	+	+++	Intermediate
Iodine	+++	+++	+++	++	+++	Intermediate
Iodophors	+++	+++	+	++	++	Intermediate
Triclosan	+++	++	+	–	+++	Intermediate

+++=Excellent; ++=Good; +=Regular; –=No activity

Table 2 Differences between brushing and alcohol solution¹²

Soap + Brushing	Alcoholic solution
Ancient ritual	Greater effectiveness
Surgical ritual	Faster action
Cultural issues	Persistent action
They've always done it this way	Fewer adverse effects
They don't want to change	No risk of rinsing
Water sterilization?	Lower water consumption
Increased water consumption	Less waste

According to the Spaulding classification developed in 1968, all materials used in regional anesthesia, peripheral and neuraxial blocks are considered critical, penetrating through the skin or mucous membranes, and reaching subepithelial tissues.¹³ Therefore, all local anesthetics and adjuvants must be packaged in factory-sterilized materials with manufacturing dates, expiration dates and product batch numbers. Like this, another fundamental piece of information for safe access to the neuroaxis is to note on the anesthesia record the manufacturing date of the drugs used, as well as the expiration date and batch number. This is what I have done since this data was included in the ampoules for use in the neuraxial. This is what I have done since this data was included in the ampoules for use in neuraxial, allowing if there are complications, to look for ampoules from the batch and verify their credibility and safety. Mainly, if there was a medical and legal process. In a study comparing 0.5% alcoholic chlorhexidine with 70% hydrated ethyl alcohol for skin antiseptics for neuraxial blocks, it was shown that 70% alcohol was more effective in reducing the number of colony forming units (CFU/cm²) after two minutes, and there was no difference between the two groups in terms of skin colonization at the end of the procedure.¹⁴

To verify whether two applications of chlorhexidine/ethanol solution are more effective than one for skin disinfection before neuraxial anesthesia, the result showed that the application of chlorhexidine/ethanol once is sufficient to disinfect the skin for regional anesthesia, and that the 2nd application may be delayed in an emergency situation, and this 2nd application increases the risk of translocation of chlorhexidine to the subarachnoid space.¹⁵

The systematic review and meta-analysis of antiseptic

In a recent systematic review and meta-analysis comparing chlorhexidine (CHX) and povidone-iodine (PVI) used for skin antiseptics, minimizing surgical site infection, it was shown that CHX should remain the first-choice agent for surgical skin antiseptics.¹⁶ Another systematic review and meta-analysis, comparing PVI with CHX showed that skin preparation with CHX is more effective than PVI in preventing surgical site infection in clean and contaminated surgery.¹⁷ The same applies to regional anesthesia in the neuraxial area. A total of 16 randomized controlled trials were included after rigorous selection from an initial pool of 1742 articles, undergoing clean or potentially contaminated surgeries, comparing CHX and PVI,

provided compelling evidence in favor of CHX as a more effective antiseptic agent over PVI in minimizing the risk of various types of surgical site infections, using the *I2* index to evaluate heterogeneity.¹⁸ In a controlled clinical trial, comparing hand washing in patients undergoing peritoneal dialysis using hand hygiene with water and glycerinated soap versus the application of 70% glycerinated ethyl alcohol gel, it showed that hand hygiene with alcohol gel produced a greater reduction in the number of colonies forming unit.¹⁹ Since the article analyzed some statistical methods to assess if randomized controlled trials (RCTs) were published by English anesthesiologist Carlisle since 2012, several meta-analysis and systematic reviews have been questioned.²⁰ The distribution of 72,261 means of 29,789 was recently analyzed variables in 5087 randomized, controlled trials published in eight journals between January 2000 and December 2015, showing that 44% had one or more mistakes and 25% had a failure or fraud rate.²¹ In an excellent Editorial²² on two articles fundamental to understanding meta-analyses and systematic reviews,^{23,24} he concludes that “to fully understand these articles, readers need to approach them with an open mind, and recognize that much of what they learned about meta-analysis may be incorrect”. The Editorial mainly addresses myths related to heterogeneity, but there are also myths related to publication bias, statistical models, subgroup analyses and other aspects of meta-analysis.

Safety and application of local anesthetics and adjuvants

To ensure patient safety by monitoring the quality and origin of medicines used in hospitals and pharmacies in Brazil, the Ministry of Health, through the National Health Surveillance Agency (ANVISA), determined by Resolution No. 157/2017 (RDC), the implementation of the National Medicines Control System (SNCM), as well as mechanisms and procedures for tracking increasingly aimed at security and fraud control.²⁵ For automation purposes during the process RDC 157/2017 determines the use of the two-dimensional barcode known as DataMatrix, whose technology, through QR or barcode capture, enables the storage and electronic transmission of data that is necessary to track and control all medication logistics in the country. The same technology guarantees support, automation, and visibility, in addition to integration between information systems for drug control.²⁵ Traceable medication packaging allows checking the validity, batch and even retrieving the history, application or

location of a given product. The adoption of procedures that allow product tracking also inhibits possible irregularities such as fraud and diversion of medications, especially controlled drugs.²⁶

How do I perform skin antiseptics for subarachnoid puncture?

As I had described at the beginning of the use of regional anesthesia in the 1970s and 1980s, the criteria for antiseptics were little publicized. Iodinated alcohol was used both to antiseptics the hands after brushing under running water and the skin for neuraxial puncture. I noticed the entire evolution of antiseptics. However, my preference was always for 70% alcohol. So, I will present how during all these years performing spinal anesthesia without any complications, it was my behavior taught and practiced (Table 3). In a recent safety

recommendations update for antiseptics during neuraxial anesthesia, it is recommended to remove any organic or inorganic matter from the skin by cleaning it with water, soap and then rinsing, when there is dirt; 0.5% chlorhexidine in 70% alcohol can be used in back-and-forth movements for 30 seconds, waiting for complete drying.²⁶ In this same recommendation proposed in 2020, in non-sterilized ampoules, the neck of the glass ampoule should be cleaned with alcohol before opening it, which is part of the anesthesiologist's routine.²⁷ However, in Brazil some laboratories provide products in sterile packaging as a way of increasing safety and reducing bacterial contamination of solutions used in neuraxial anesthesia.²⁷ Although washing hands with sponges containing water and chlorhexidine soap is still used, current evidence favors rubbing hands with products containing alcohol and n-propanol, especially in places where the quality of rinsing water cannot be assured.²⁷

Table 3 Antiseptics technique for spinal puncture

Phases	Conduct
1	Entrance to the surgical center washing hands with soap
2	With the patient in the puncture position, antiseptics with 70% alcohol or alcoholic chlorhexidine.
3	After antiseptics with a single layer, opening the tray for blocking.
4	Never dry the antiseptic with gauze and allow it to dry spontaneously.
5	After opening the tray, placing the needle and sterilized local anesthetics.
6	Verification of the batch, date of manufacture and expiration date of anesthetics.
7	Aspiration of liquid from the ampoule.
8	Choosing the space to be punctured.
9	Infiltration with local anesthetic with syringe and insulin needle.
10	Wait for it to take effect.
11	Subarachnoid puncture with the chosen needle.
12	If Whitacre uses a 20G introducer.
13	If it is Quincke, do not use an introducer.
14	Subarachnoid injection with chosen dose and local anesthetic.

Conclusion

In all three application areas and for all outcomes, we found good evidence favoring chlorhexidine-alcohol over aqueous competitors, but not over competitors combined with alcohols. The perceived efficacy of chlorhexidine is often in fact based on evidence for the efficacy of the chlorhexidine alcohol combination. The role of alcohol has frequently been overlooked in evidence assessments.⁸ This has broader implications for knowledge translation as well as potential implications for patient safety.

In Brazil, chlorhexidine for antiseptics is used at 0.5%, with a forecast of increasing to 2%. However, the cost of antiseptic solutions such as 0.5% alcoholic chlorhexidine is R\$50.00 (US\$ 10), the aqueous solution is R\$20.00 (US\$ 4) and the 70% ethyl alcohol solution is R\$4.00 (US\$ 0.80). The value of 70% alcohol is 8% the value compared to alcoholic CHX and 20% of the value to the aqueous CHX solution. Therefore, given the cost in Brazilian Health System (SUS) hospitals, 70% alcohol should be chosen, both for hand antiseptics and for the patient's back for subarachnoid puncture.

Anesthesiologists have many reasons and passions for practicing their profession, at age 79 and in my 50th year of practicing anesthesia.²⁸ Likewise, at one year younger (78 years old) I continued teaching and researching mainly in regional anesthesia, which led me to write this Editorial with my collaborators, to improve antiseptics during access to the neuraxial, which is properly protected with a bone framework and nine steps to reach the subarachnoid space. God or the evolution of human beings were wise in this protection of the spinal cord.

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Conflicts of interest

None.

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