Updates in Continuous Spinal Anesthesia

Essay

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Contents

List of Abbreviations

Abbrev.	Meaning
ASA	American society of anaesthesiologists.
aPTT	Activated partial thromboplastin time
CSA	Continous spinal anesthesia.
CSF	Cerebrospinal fluid.
CNS	Central nervous system.
CSE	Combined spinal epidural
COPD	Chromic obstructive pulmonary disease.
CPB	Cardiopulmonary bypass.
CES	Cauda equine syndrome.
CPR	Cardiopulmonary resuscitation.
CTZ	Chemoreceptor trigger zone.
FDA	Federal drug administration.
GABA	Gamma amino-butyric acid.
IT	Intrathecal.
IONV	Intraoperative nausea and vomiting.
LA	Local anesthetic.
LMWH	Low molecular weight heparin.
PDPH	Postdural puncture headache.
SSSA	Single shot spinal anesthesia.
SVR	Systemic vascular resistance.
TNS	Transient neurologic symptoms.
UFH	Unfractionated heparin

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Abstract

Continuous Spinal anesthesia (CSA) as a technique evolved since Augustus Bier described the first Spinal anesthetic with Cocaine in 1899, and in 1906 Henry Percy Dean invented the "exploring needle" which can be left in situ during the operation so that at any moment another dose can be injected. CSA has marked advantages in certain clinical circumstances, particularly patients undergoing lower body surgery who are old and/or have co-morbidities, they can benefit from avoiding the risks of endotracheal intubation and general anesthesia and in the same time avoiding rough hemodynamic changes associated with other types of neuraxial blocks without losing their advantages. Also the intrathecal catheter can be used for post-operative analgesia and for long term intrathecal drug administration to control chronic pain or spasticity. There are many types of intrathecal catheters that can be used with different techniques of insertion, advantages and disadvanatages. Also there are possible complications to the technique which must be understood and managed, and contraindications with which the technique should be avoided or modified.

Keywords: Continuous Spinal anesthesia, neuraxial anesthesia, neuraxial blocks, high risk patients, intrathecal catheter, continuous analgesia, post-operative analgesia, chronic pain management, intrathecal pumps.

Introduction

Continuous Spinal anesthesia (CSA) is the technique of producing and maintaining Spinal anesthesia with small doses of local anesthetic which are injected repeatedly as required into the subarachnoid space via an indwelling catheter.

Continuous Spinal anesthesia (CSA) as an alternative to general anesthesia for many surgical procedures is a method almost as old as the technique of Spinal anesthesia itself. Augustus Bier described the first Spinal anesthetic with Cocaine in 1899 and in 1906, Henry Percy Dean described a technique in which Spinal anesthesia could be extended. Dean was aware that Ester local anesthetic agents did not usually last long, that the dose requirement of local anesthetic agent varied in each patient and that the duration of surgery could be different. To overcome this, he considered giving another injection during the surgical procedure and he invented the "exploring needle" which can be left in situ during the operation so that at any moment another dose can be injected without moving the patient beyond a slight degree. However, the technique did not become accepted into practice and his efforts to promote it were probably limited due to his ill health and his retirement in 1933 ***(Jaitly and Kumar, 2009).***

CSA was rediscovered in 1940 and went through a "stuttering evolution" through the 20th century by Tobias et al. who gave a fascinating account of this technique. The CSA technique evolved further in the 1990s when Spinal micro-catheters were introduced, but the technique was surrounded by controversy due to assumed occurrence of Cauda-Equina syndrome leading to the banning of Spinal micro-catheters by the Federal Drug Administration (FDA) in the USA. But Denny questioned the etiology of Cauda-Equina syndrome and stated that "For a number of years and on several occasions CSA has prevented patients from needing postoperative ventilation and it would be unfortunate if this extremely useful technique was abandoned due to its inappropriate application". While in the same time, CSA continued to be used in clinical practice outside of the USA ***(Benonis and Habib, 2008).***

CSA has been used in medically complicated patients (as in patients with respiratory failure) undergoing cardiac, vascular, orthopedic, and general surgeries. Many authors advocate general anesthesia with or without Epidural analgesia as first choice in fit patients undergoing abdominal procedures. While in selected patients undergoing surgeries on the lower extremities, perineum, groin and lower abdomen, who are living at the edge of their cardiovascular and respiratory physiological reserves

and in whom general anesthesia is likely to increase morbidity and mortality, many authors advocate CSA as an alternative to general anesthesia ***(Benonis and Habib, 2008).***

CSA allows conduction anesthesia to be tailored to individual patient needs and also for surgical operations of long durations. The Spinal anesthesia is not more dangerous than Epidural anesthesia, but when we combine the potential lack of knowledge with the unforgiving subarachnoid space and with the narrow "therapeutic window" for Spinal local anesthetics, a background for significant iatrogenic injury is set. It is with this in mind, as well as from the historical perspective that the technique and its current applications are discussed ***(Fuzier et al., 2012).***

The best way to examine the clinical applications for CSA is by comparing it to other available major conduction anesthetics: single-shot Spinal anesthesia, continuous Epidural anesthesia and combined single-shot Spinal & continuous Epidural anesthesia and also to general anesthesia. Catheters used for performing CSA differ in sizes (gauge) and in technique of insertion:

1- Epidural catheter (macro-catheter):

A standard Epidural catheter can be used for continuous Spinal anesthesia (standard Epidural catheters range from 18 to 20G). The catheter is inserted into the subarachnoid space after a deliberate Dural puncture with an Epidural needle. These sets are widely available and little additional training is required for those familiar with inserting a normal Epidural catheter. However, performing a deliberate dural puncture with an Epidural needle may be psychologically difficult for some experienced clinicians, also Post Dural Puncture Headache (PDPH) is a risk as we will see later. It should be put in mind that if this catheter type is left in situ for post operative pain relief then there is potential for error, as an Epidural dose of drug could be administered intrathecally ***(Fuzier et al., 2012).***

2- Catheter over-needle type:

Represented by the B Braun SPINOCATH®. Perceived advantages of this kit is that CSF does not leak because the hole made in the Dura by the Spinal needle is sealed by the wider bore catheter resulting in less incidence of PDPH, also there is an unequivocal endpoint of catheter placement in the subarachnoid space because CSF can be aspirated through the catheter ***(Gosch et al., 2008).***

3- Catheter through-needle type:

These catheters are available in varying sizes ranging from 25G (macro-catheter) to 32G (micro-catheter). Pajunk Intralong® manufactures 27G and 25G catheters which are introduced through 22 or 21G Sprotte needles. Smith Medical® produces the PORTEX® kit, a 28G micro-catheter with a 23G Crawford needle. Kendal® produces a 28G micro-catheter with a 22G Sprotte needle ***(Gosch et al., 2008).***

In this study we will try to discuss the commercially available CSA kits and related devices, the advantages and indications of the CSA technique itself, its limitations and complications.

Aim of the work

In this study we will try to discuss the history and anatomical considerations of CSA, the commercially available kits and related devices, the advantages and indications of CSA technique itself, its limitations and complications.