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MISCELLANEOUS

Lumbar spinal anesthesia with cervical nociceptive blockade. Critical review of a series of 1,330 procedures☆

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Abstract

Background and objectives: The manufacture of minimally traumatic needles and synthesis of pharmacological adjuncts with safe and effective action on inhibitory and neuromodulatory synapses distributed along the nociceptive pathways were crucial for a new expansion phase of spinal anesthesia. The objectives of this paper are present our clinical experience with 1330 lumbar spinal anesthesia performed with purposeful nociceptive blockade of the thoracic and cervical spinal nerves corresponding to dermatomes C4 or C3; warn about the method pathophysiological risks, and emphasize preventive standards for the safe application of the technique.

Content: Review of the historical background and anatomical spinal anesthesia with cervical levels of analgesia. Description of the technique used in our institution; population anesthetized; and surgery performed with the described method. Critical exposition of the physiological, pathophysiological, and clinical effects occurred and registered during anesthesia-surgery and postoperative period.

Conclusion: Spinal anesthesia with nociceptive blockade to dermatome C4, or C3, is an effective option for surgery on somatic structures distal to the metamer of the third cervical spinal nerve, lasting no more than four or five hours. The method safety depends on the unrestricted respect for the essential rules of proper anesthesia.

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PALAVRAS-CHAVE
Raquianestesia;
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Intercorrências;
Prevenção;
Tratamento

Raquianestesia lombar com bloqueio nociceptivo cervical. Revisão crítica de uma serie de 1.330 procedimentos

Resumo

Justificativa e objetivos: A fabricação de agulhas minimamente traumáticas e a síntese de coadjuvantes farmacológicos com ação efetiva e segura nas sinapses inibitórias e neuromoduladoras distribuídas ao longo das vias nociceptivas foram determinantes para uma nova fase de expansão da anestesia subaracnoidea. Os objetivos deste artigo são: apresentar a experiência clínica dos autores com a realização de 1.330 Raquianestesias lombares com bloqueio nociceptivo proposital dos nervos espinhais torácicos e cervicais até os dermátomos correspondentes a C4 ou C3; alertar sobre os riscos fisiopatológicos do método e enfatizar as normas preventivas para a realização da técnica com segurança.

Conteúdo: Revisão dos fundamentos históricos e anatomofuncionais da anestesia subaracnoidea com níveis cervicais de analgesia. Descrição da técnica utilizada em nossa instituição; da população anestesiada e das cirurgias realizadas com o método descrito. Exposição crítica dos efeitos fisiológicos, clínicos e fisiopatológicos ocorridos e registrados durante o ato anestésico-cirúrgico e no período pós-operatório.

Conclusão: A Raquianestesia com bloqueio nociceptivo até o dermátomo de C4, ou de C3 é uma opção efetiva para cirurgias sobre estruturas somáticas distais ao metâmero do terceiro nervo espinhal cervical com duração não superior a 4 ou 5 horas. A segurança do método depende do respeito irrestrito às regras essenciais da correta prática anestésica.

Introduction

We started the extensive trial of spinal anesthesia (SA) for abdominoplasty and liposuction in 2004. When we find that often the breast region, innervated by intercostal nerves from T2 to T7, long lateral thoracic nerve derivative of the brachial plexus, and lower cervical plexus branches, also had surgical anesthesia, it encouraged us to use the method for mammoplasty and since then SA has become the technique of choice of our Service for such procedures.[1,2] In 2007, we developed a Specific Anesthetic Form (SAF-SA) in which we registered the SA performed for cosmetic and/or abdominal and thoracic repair procedures and the main intraoperative and postoperative events.[3–9] This article is the result of the SAF retrospective review of 1330 consecutive SA performed between December 2007 and December 2013.

High spinal anesthesia is not new in anesthesiology literature. Jonnesco in 1911, Le Filiartre in 1921, and H Koster in 1928 left important historical legacies on the technique.[10]

By the 70s of last century, Reynolds, Hudges, Bonica, Melzack, and Wells, among others, performed the pioneering studies of neuromodulation of pain in spinal cord segments, suprasegmental structures of the brain stem and adjacent subcortical areas. These synapses' inhibitory neurotransmitters and modulators were identified, and the pharmaceutical industry synthesized exogenous agents able to mimic these actions.[11–14] Sufentanil and clonidine are listed as two of the adjuvant drugs most experimentally and clinically studied by the subarachnoid route. Extensive scientific documentation confirms and supports the safety of the opioid and alpha-2 adrenergic association to 0.5% hyperbaric bupivacaine improving the SA quality, duration, and residual analgesia.[15–32]

Method

The study protocol was approved by the Research Ethics Committee of Hospital Santa Casa de Misericórdia, Santos, SP.

Patient selection

In this series of procedures 1330 subjects were enrolled, with physical status ASA I or II, between 17 and 72 years old, scheduled for plastic surgery in upper areas of the body, with an expected maximum duration of five hours, without contraindication for SA and who, after clarification on the technique, record, and review of data collected for this study, give their written consent.

Technique description

Perform a complete check of all anesthetic material in the operating room (OR).

Dilute and label 50 mg of ephedrine in 10 mL of saline solution (SS) or distilled water (DW) and have atropine, metaraminol, and adrenaline ampoules for immediate opening if required.

Make sure that the operating table is able to offer a 30° head-down tilt position and securely attach the mat to prevent it from sliding.

Check all sterile and disposable materials for spinal anesthesia, including 27G Whitacre needle and ampoules in sterile cases of 0.5% hyperbaric bupivacaine, sufentanil 5 µg mL^{-1}, and clonidine 150 µg.[33,34]

Confirm the identity of the patient, the procedure to be performed, the preoperative evaluation information, and the administration of pre-anesthetic drug (midazolam 15 mg orally).

Monitor vital parameters (SBP, DBP, MAP, HR), cardiac rhythm, percentage of hemoglobin saturation, and level of consciousness/sedation according to Ramsay Scale. Record the baseline measured values as time reference ''zero''' in SAF-SA.

Catheterization of upper limb peripheral vein with Jelco 20 or 22G, proceed to institutional antibiotic therapy and begin rapid infusion of the first 500 mL infusion of Ringer lactate.

Adapting and fixing nasal catheter for continuous supply of O_2 at a flow rate of 2 L min. Position the patient in a sitting and relaxed position; perform the antisepsis of the lumbosacral region with chlorhexidine 0.5%; choose the most favorable interspace between L2/L3 or L3/L4; consider the convenience of the previous local infiltration with lidocaine 0.5%; perform the subarachnoid puncture and after the free flow of the cerebrospinal fluid inject the anesthetic mixture of sufentanil 5 μg, clonidine 150 μg, and bupivacaine 0.5% hyperbaric 20 mg with the highest possible speed. After the injection, the patient should be immediately placed in the supine position and with the same promptness tilt the table 30° head-down, taking care to prevent patient sliding, and keep this position for 15 min. Measure vital signs and record them every 5 min in the SAF-SA.

After waiting 15 min, put the operating table in the horizontal plane and complete antisepsis care of the surgical area, check out the sensory block level with the pinprick test (needle 30 × 7), and authorize the start of surgery.

Hemodynamic control

The ''trigger'' for intravenous administration of ephedrine 10 mg is SBP below 85 mmHg. Regarding bradycardia, atropine 0.5 mg administered when HR is below 55 bpm. In cases of tachyphylaxis or insufficient response to ephedrine, metaraminol 0.25 mg administered very slowly with careful attention to HR. Fluid therapy is continued according to the classical criteria. Hyperhydration is not necessary. In liposuction, the saline and adrenaline volumes infiltrated during the wet or tumescent technique must be registered and should not contain lidocaine.[35–38]

Ventilation

If there is hypoventilation due to excessive sedation or respiratory depression caused by anesthetic block, ensure upper airway patency and assist ventilation to the efficient and safe return of spontaneous respiration (SR).[39,40]

Sedation

After blockade installation, sedation should be light, comfortable, and safe (Ramsay grade III or IV) with permanent airway monitoring. Intravenous administration of fractionated doses of midazolam (1 mg) associated or not with doses of S+ ketamine (2.5 mg).[41]

Table 1 Distribution of patients according to sex and ASA classification.

Total number of patients	1330
Female: 1271	Male: 59
ASA ı: 883	ASA ıı: 447

ASA, American Society of Anesthesiologists.

Table 2 Distribution of patients according to age.

<20 years	19	1.4%
Between 20 and 29 years	181	13.6%
Between 30 and 39 years	394	29.6%
Between 40 and 49 years	446	33.5%
Between 50 and 59 years	223	17.0%
Between 60 and 69 years	58	4.3%
> 69 years	9	0.6%

Changes in surgical positioning

Evaluate whether it is prudent to give 10 mg of ephedrine one minute prior to mobility, notify and request the patient cooperation during movements. Avoid abrupt maneuvers.[42,43]

In the final stages of the procedure, if there is no contraindication, give dipyrone 25 mg kg^{-1} and tenoxican 0.5 mg kg^{-1} IV. If there are risk factors for post operative nausea and vomiting (PONV), add antiemetics. Continue monitoring until the end of dressings, command the transference to the stretcher and take the patient to the post anesthesia care unit (PACU) where hemodynamic, respiratory, and analgesic monitoring should be continuous and recorded by the nursing service. Sign the discharge order from PACU with Aldrete and Kroulick Index 9 or 10, without pain and PONV.

In the ward, the Nursing Service should record in the SAF-SA the patients' clinical outcome, pain intensity by visual numeric scale (VNS), and the occurrence of adverse events related to the anesthetic technique.

Physical and clinical characteristics of patients

Tables 1–7.

Discussion

The relative density at 37 °C and the volumes of the administered pharmacological agents are: clonidine: 0.99940 (1 mL), sufentanil: 0.99930 (1 mL), both, therefore,

Table 3 Distribution of patients according to body weight.

<50 kg	106	7.9%
Between 50 and 59 kg	266	20.0%
Between 60 and 69 kg	373	28.0%
Between 70 and 79 kg	425	31.9%
Between 80 and 89 kg	105	7.8%
>89 kg	55	0.6%

Table 4 Subarachnoid puncture site and degree of difficulty.

L2–L3	1237	93.1%
L3–L4	93	6.9%
1st attempt	1011	76.0%
2nd attempt	226	16.9%
>2 attempts	93	6.9%

Table 5 Total number and percentage of surgeries performed.

Type of surgery	Total	%
Mammoplasty	324	24.4
Abdominoplasty	357	26.8
Liposuction contouring	307	23.1
Combined surgeries	342	25.7

Table 6 Percentage of patients receiving cardiocirculatory acting drugs.

Drug	% of patients
Ephedrine	100
Atropine	52
Metaraminol	8
Adrenalin	0.07

are located at the limit between the iso and hypobaricity regarding the CSF of relative density at 37 °C, variable between 0.99440 and 1.00230. The volume of 4 mL of bupivacaine 0.5% in hypertonic solution of glucose is frankly hyperbaric (1.02360) compared to cerebral spinal fluid (CSF). We found no bibliographic reference on the relative density corresponding to the mixture of bupivacaine, clonidine, and sufentanil used in this study; however, its obvious rostral spread in the patient positioned in a head-down tilt position endorses its hyperbaric condition.[44,45]

Table 7 Events and complications.

Type	Percentage
SBP <85 mmHg at the OR/PACU	100.00
HR <55 bpm at the OR/PACU	57.00
Lipothymia at the ward	23.00
Apnea at the OR	1.30
Hb saturation < 90% at the OR	31.00
Pruritus at the OR and PACU	33.00
PONV at the PACU and ward	7.00
Urinary retention at the ward	3.00
Headache post-SA	0.30
Transient neurological sequelae	0.07
CA	0.07
Death	0.00

The absence of pain to vigorous stimulation with a 30×7 hypodermic needle into the skin area corresponding to the sternum notch, or slightly cephalad at the sternal notch confirms the blockade of nociceptive fibers A-delta and C up to the metamer of the 4th or 3rd pair of cervical spinal nerves. This level of somatic anesthesia implies full thoracolumbar sympathetic block. In approximately 30% of patients, we proved the lack of sensitivity to pinprick in facial regions innervated by afferent nociceptive branches: mandibular, maxillary, and ophthalmic of trigeminal nerve that has its first-order neurons in the ganglion of Gasser, from where the afferent axons project toward the central sensory nucleus located at the level of the brainstem bridge. The point of emergence for the X cranial nerve (CN) toward its vast peripheral territory occurs at the bulb level; therefore, caudally in relation to V (CN).[46,47] In the absence of anatomical barrier between the CSF of brain and spinal compartments, nothing prevents the hyperbaric anesthetic mixture injected into the lumbar subarachnoid space to disperse cephalad into the brainstem[40,48] and that diluted concentrations of the same mixture may interact in ascending sequence with the vagus autonomic B fibers, trigeminal A-delta and C nociceptive fibers, and other suprasegmental synapses related to the emotional and behavioral autonomic modulation of pain. This feasible possibility provides the anatomical basis for the following clinical signs seen in most patients in this study: (1) attenuation of vagal ''exacerbation'' expected as a result of the total sympathetic blockade; (2) trigeminal territory analgesia proved by performing small facial procedures, such as chin liposuction, filling expression folds, and removal of small tumors from neck and face, without additional local or intravenous anesthesia; (3) feeling of satisfaction and well-being reported by patients at the end of surgery and lack of frequent shivering upon awakening from general anesthesia.[3,6,11,13,14,16,36,49]

Regarding hemodynamic aspects, hypotension and decreased heart rate (HR) are physiological consequences inherent to spinal blocks. In this study's patients, bradycardia and hypotension responded satisfactorily to treatment with antimuscarinic and vasopressors. Classically, the etiology of bradycardia is attributed to autonomic blockade of sympathetic preganglionic fibers from T4 to T1 and consequent release of cardioinhibitory reflex of vagal origin. Hypotension is related to the decrease of three factors: systemic vascular resistance, venous return, and cardiac output (CO). The intensity of blood pressure (BP) fall is considered proportional to the extent of the sympathetic thoracolumbar chain blockade.[37,38,42,50] It should be noted that these classical concepts sedimented in reasoning and collective practice are based on spinal anesthesia performed exclusively with local anesthetics. What we observed in this series of spinal anesthesia with the addition of sufentanil and clonidine to local anesthetic is that without changing the classic risk profile it allows good cardiocirculatory stability with minimal pharmacological intervention. The attenuated hemodynamic effect is in part due to the beneficial interference of the following physiological factors: in healthy adult, in supine and at rest, unlike what happens during activities in the upright position and hypovolemic states, the sympathetic system participates in the maintenance of systemic vascular tone with only 20% of its total capacity. The sinus node automaticity and the

Frank-Starling law of the heart in normovolemic conditions are able to maintain sufficient CO and HR to the basal needs as occurs in denervated and transplanted hearts. The microcirculation which constitutes more than 90% of the cardiovascular area has efficient flow controls dependent on metabolic releasing factors and local action, and finally, in addition to catecholamines there are other systemic vasoactive mediators, such as angiotensin, dopamine, and serotonin, which are not blocked by SA.[6,43,50] In 1994, Oberlander performed electrophysiological studies with newborn animals and demonstrated that the sympathetic blockade promoted parasympathetic inhibition reflex, which partially explain the fact that normovolemic newborns and infants do not develop bradycardia or hypotension even under complete spinal block.[51] Similarly result could be produced by diluted concentrations of the anesthetic mixture administered in this study, at the brainstem level.

Within safe limits, decreased HR and BP under anesthesiologist control are beneficial and desirable to reduce intraoperative blood loss. All patients in this study, at some time of surgery or at PACU, had SBP below 85 mmHg. The rule is to relocate the pressure level above the safety limit with doses of ephedrine 10 mg. In 8% of patients, ephedrine was not sufficient for BP stabilization and metaraminol administration was required. Due to sudden and severe bradycardia that this eminently $\alpha 1$ vasoconstrictor is capable of producing, we make the following recommendations: prepare highly diluted solutions containing 0.25 mg of metaraminol per mL, give only 1 mL each time and, before giving metaraminol, have another syringe prepared with atropine 0.5 mg. We give atropine before metaraminol if HR is less than 60 bpm. Subsequent doses of metaraminol require the same care.

All patients in our study suffered a decrease in basal HR. In 52% of them, HR was lower than the 55 bpm adopted as limit and trigger for the intravenous administration of atropine at doses of 0.5 mg, which can and should be repeated until the return of HR to safe levels. Severe or moderate bradycardia is the most important predictor signal of cardiac arrest (CA) during SA.[52] Not treating significant bradycardia and hypotension resulting from SA is comparable to giving neuromuscular blocker or hypnotic doses of propofol without patient ventilation.

In the series of 1330 consecutive SA reviewed in this paper, there was one case of CA, which occurred in a female ASA I patient, aged 30, who underwent liposuction. The anesthesiologist who performed the puncture and started the anesthesia had to leave the OR and left as substitute another anesthesiologist with less experience in the technique. In 45 min of operation, the following values were measured: BP 80/40 mmHg and HR 50 bpm, which were not immediately corrected in accordance with the study protocol rules (ephedrine 10 mg and atropine 0.5 mg) on the grounds that, despite the hypotension and bradycardia, hemoglobin saturation remained satisfactory at 95%. Very severe bradycardia came next and, in sequence, asystole observed by isoelectric baseline in cardioscope and pulse oximeter. Treatment was immediate and consisted of external cardiac compression (ECM) made by the surgeon, ventilation under mask, followed by tracheal intubation (TI) and administration of intravenous adrenaline (1 mg). The response was rapid and favorable with cardiac activity return in sinus rhythm, rate greater than 150 bpm and BP

180/90 mmHg. The patient recovered in the ICU and was later discharged without neurological sequelae. It was, therefore, an absolutely avoidable CA in which the anesthetic technique cannot be exclusively held responsible. Some studies include young and healthy patients in CA risk groups during SA. One needs to reconsider whether acts of negligence or recklessness are not under-investigated at the conclusion of these statistics.[53–56]

When the patients are transferred to the recovery room, they are accompanied by labeled syringe of epinephrine used in the OR, as hypotension is likely to continue during recovery from anesthesia and even later in the wards where one of the most observed complications was lipothymia. These observations confirm the assumption that hemodynamic monitoring should be continued until the complete blockade resolution and hospitalization should not be less than twenty hours from the lumbar puncture.[42] Special care should be taken in patients undergoing major liposuction.[7]

We noted that some moderate hypertensive patients treated with beta-blockers or angiotensin converting enzyme (ACE) inhibitors received higher doses of ephedrine/ metaraminol and atropine, but the data collected was insufficient to qualified analysis and statistical conclusions.[39]

During hyperbaric lumbar SA in the sitting position, the lumbosacral motor roots are quickly blocked. By positioning the patients immediately supine and tilted head-down, the hyperbaric anesthetic mixture is dispersed in the cephalic direction and the initial concentration of the solution will be diluted in the course as it moves away from the puncture site.[5,46,47] With the sensory block already installed on C3, there is vasodilation in the upper limbs and muscle activity partially preserved. The patient does not feel the pain of liposuction in the arms, but can still move them. This differential blockade happens for three reasons: first, the maximum concentration (Cm) of bupivacaine that reached the brachial plexus was enough to block the nociceptive A delta and C fibers, but not enough to block the motor Alpha fibers; second, in supine position the hyperbaric local anesthetic is distributed preferentially around the posterior nociceptive roots; and third, the cervical roots compared to the thoracic and lumbar roots has more perpendicular and short courses within the spinal canal, and therefore lesser extent of exposure to the diluted local anesthetic in the CSF.[46–48] In the breathing muscles, there are the following clinical signs: relaxation of abdominal muscles (obliques, transverse, and *rectus*) auxiliary of active expiration, of coughing and expectoration. The internal intercostal muscles (expiratory) and external (inspiratory), due to the decreasing CM are less blocked as they approach T1. The Phrenic Nerve, responsible for the main muscle of inspiration activity, has its origin in the anterior roots of C2 and C3 and its motor activity is preserved for the same reasons indicated for the brachial plexus motor function.[57] At baseline and rest conditions, diaphragmatic contraction is sufficient to ensure adequate tidal volumes. The mismatch between the active diaphragm and other respiratory partially or totally relaxed muscles causes diaphragmatic or external paradoxical breathing. For the reasons described, as the spinal blocks reach more cephalic metameric levels, the inspiratory capacity is less changed, while the expiratory capacity is reduced in direct proportion to the number of blocked metameric levels. For this reason, the SA with the method described in this

article should be avoided in obese patients and in those with chronic lung disease.[58–61] Our series had 17 cases of prolonged apnea with HR and BP preserved, thus, excluding the blood reduced flow from bulbar respiratory centers as a cause of the event. The episodes of apnea occurred before the 30 min after the subarachnoid puncture, with progressive decrease in respiratory rate and consciousness for periods of time varying between 5 and 35 min. Patients were ventilated manually in semi-closed system with facial mask and one of them with laryngeal mask. Spontaneous breathing and consciousness gradually returned without memory of the fact. It is reasonable to disregard that these periods of apnea and unconsciousness were produced predominantly by critical concentrations of the anesthetic mixture in the CSF around the brainstem.[40,48] Thirty one percent of patients at some time during anesthesia had hypoventilation characterized by reduced hemoglobin saturation, coincident with deeper levels of central sedation and participation of the obstructive peripheral component due to the pharyngeal muscle relaxation. All patients improved quickly with the usual maneuvers of upper airway clearance. Sedation is an issue that requires special care, as many patients say they are sleepy and did not hear or feel anything. This dilemma requires patience and persuasion strategies by the anesthesiologist, because excessive sedation is associated with lower cardiorespiratory safety. When administering intravenous fractionated and parsimonious doses of midazolam (1 mg) associated or not with doses of ketamine S+ (2.5 mg), one should consider the sedative action of clonidine and sufentanil used in the anesthetic mixture. Patients who received oral premedication with midazolam (15 mg) 15 min before being transported to the OR had less need for intravenous sedatives and more stable and secure degree of sedation with lower incidence of reduced hemoglobin saturation in the intraoperative period.[41,62] The use of droperidol during spinal blocks is associated with reports of arrhythmias and cardiac arrest refractory to treatment; thus, it should be formally contraindicated.

During liposuction, fat grafts, and mammoplasties, the surgical team usually asks for several changes of patient positioning. The loss of sympathetic vasomotor activity can provide adaptive imbalances between intravascular continent and content during sudden movements, especially in the great vessels with repercussions on rhythm, CO, and BP. The prone position during spinal blocks is related to several reports of serious complications. The guidelines for positioning changes (see above) were effective in preventing complications.[37–39,53,56,63]

Facial pruritus around the mouth, eye, and nose during surgery or during recovery from anesthesia was reported by 33% of patients. Most of the time, it is tolerable under surface sedation, but can become intense and require careful deeper sedation or specific treatment.[17]

In cases of combined surgery, it is prudent to request the initiation of surgery by the thoracic procedures followed by the abdominal, as nociceptive sensation gradually returns in the most cephalic areas of the blockade around the fourth hour and then return in direction and sequence. In most patients, somatic surgical analgesia persists on T7 at the fifth hour and on T10 at the sixth hour. In cases where anesthesia was insufficient to complete the mammoplasties in the areolar region, skin and subcutaneous infiltration was performed with lidocaine 0.25% or we assumed ventilation and increased sedation with ketamine and midazolam S+, or with sedative doses of propofol in infusion pump.[41,64]

In the PACU, the return of lower limbs movements occurred between the fifth and seventh hour. Fifty six percent of patients were discharged from PACU without referring any adverse effect, with cardiovascular stability, without use of vasoactive drugs, conscious, and without pain. The most frequent complications in other patients were: systolic BP <85 mmHg, VNS >3, itching, HR <55 bpm, and PONV (Table 7). All complications satisfactorily responded to specific treatment.

During hospitalization in wards, 64% of the patients progressed without pain or other complaints or adverse effects. It is worth noting the significant incidence of lipothymia during the first or second attempt to get out of bed by most cases after ten hours postoperatively. All cases improved rapidly with supine position and lower limb lifting at 90°, without vasoactive drugs and with the recommendation to wait two hours to retry walking. BP and HR measurements after the condition improvement and with the patient supine position showed normal values. Twelve percent of patients reported pain >5 in the VNS, but 12 h after the blockade.

A 56 year old patient complained of paresis and paresthesia in the distal end of the right leg in the sensory and motor area of L4 and L5,[65] with the onset of symptoms before hospital discharge. The transient neurological symptoms were treated with common analgesics, pregabalin, and physiotherapy, and showed progressive improvement from the 15th postoperative day and subsequent complete resolution.[66,67]

Our incidence of headache after typical spinal anesthesia was 0.3%, and in most of them the puncture was single. Headache was mild to moderate and evolved favorably with common painkillers without autologous epidural blood patch.[68,69]

Conclusion

Lumbar spinal anesthesia with nociceptive blockade in cervical dermatomes performed with hyperbaric mixture of 20 mg of bupivacaine 0.5% combined with 150 µg of clonidine and 5 µg of sufentanil is an effective option to perform abdominoplasty, surgery on breast tissue, liposuction of body regions innervated by distal C3 spinal nerves, provided that the duration of the procedure does not exceed four to five hours. The technique safety depends on the absolute respect to the contraindications of SA, knowledge of the physiological effects, and attentive and constant vigilance of the anesthesiologist to the correct treatment of the potential complications of intravenous sedation associated with SA.

Conflicts of interest

The authors declare no conflicts of interest.

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