

The comparison of general anaesthesia using the bispectral analysis (BIS) and spinal anaesthesia in terms of the one-day health care for haemorrhoid surgery using the HAL-RAR method

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Abstract

OBJECTIVES: The gradual advancement of one-day surgery and conjoint ambulatory anaesthesia results from possibilities to execute mini-invasive surgeries. Such surgeries offer great benefits to the patient due to faster reconvalescence and less pain as well as faster return to normal life. The HAL-RAR method for haemorrhoid surgery, introduced as early as in 1995 by Dr. Morigan in Japan.

DESIGN AND SETTING: The goal of our study including 137 patients was research of effects of the spinal and general anaesthesia while monitoring the Bispectral Index (BIS) during the surgery. We focused mainly on the need of postoperative analgesia and possibility to discharge patient to home care after the surgery with the above mentioned type of anaesthesia. BIS helped us to monitor the sufficiency of anaesthesia and anaesthetics dosage regulation that was reflected in earlier awakening and faster reconvalescence, as well as saving anaesthetics.

RESULTS: The length of surgery was not affected by the particular type of anaesthetic procedures (25.7 minutes for the general anaesthesia and 30.2 minutes for the spinal anaesthesia). The need for postoperative analgesia was necessary for the period of 240.0 minutes after the completion of surgery for the general anaesthesia and 313.0 minutes for the spinal anaesthesia after the administration of anaesthetics intrathecally.

CONCLUSIONS: BIS is a processed EEG parameter measuring the hypnotic effect of hypnotics and sedatives in brain. BIS helps to reduce the use of anaesthetics during anaesthesia. Our results are promising and we continue in the study, monitoring also other possible parameters.

INTRODUCTION

HAL method (haemorrhoidal artery ligation) was developed in 1995 by Dr. Morinaga in Japan (Morinaga 1995). This is a new system using mini-invasive surgical technique for treatment of haemorrhoids without the need to cut and an open wound. In 2005, the RAR (recto-anal repair) was added to the method, which is an arrangement of prolapsed rectal haemorrhoids. In Slovakia, according to our knowledge, there are only two places where the haemorrhoid surgery using this method takes place. In our healthcare facility – CIB-AMED Prievidza – we started to use this type of surgery in October 2010 and until the end of August 2012, there were 137 patients successfully operated on by the HAL-RAR method.

The advantages of the HAL method are in rapid identification of haemorrhoidal artery end points using a small Doppler probe, its accurate ligation and the following immediate proof of ligation. The minimization of pain is a great benefit to the patient. The results show 90 percent success rate and minimization of complications (Giordano 2009). As this is relatively short surgery, it is also suitable for one-day surgery.

The RAR method for adjustment of prolapsed external haemorrhoids is used after or at the same time with the HAL method, depending of the type of probe, which enables to use the method at the same time or after. This is ligation of prolapsed mucosa and the following sliding inside. According to several studies (*citation is needed*), this method is effective for all haemorrhoid states with limitation for the Grade 4 haemorrhoids with the heavy prolapse.

In December 2011, Wan Jo Jeong *et al.* (Jeong 2011) published the prospective cohort study, they were examining the effect of the HAL-RAR method and patient satisfaction with this surgery. In the above mentioned study, taking place between March 2008 and May 2010, they examined 97 patients who were subjected to the haemorrhoid surgery by the HAL-RAR method. They were interested in the occurrence of relapse, complications and pain stated by patients before surgery and after surgery. The patients were examined on day 7 after the surgery, one month and three months after discharge and finally also one year after the surgery, either by outpatient visit or on the phone. For the purpose of the study, the relapse is defined as repetitive bleeding from haemorrhoids or re-prolapse. Out of 97 patients, there were 62 men and 35 women with the average age of 51.7 ± 13.2 years (range 22 to 87 years). The length of surgery averaged 34 ± 7.3 minutes. The patients were operated in the total intravenous anaesthesia, spinal anaesthesia or local anaesthesia. The effect of anaesthetic technique was not taken into the account. In the conclusion, the authors describe very good results of this method. The patient satisfaction is high due to small painfulness and reduction of postoperative pain, compared to preoperative pain, small to none occur-

rence or relapse and minimum of complications with necessity of hospitalization. The comparison was also in accordance with the most used haemorrhoid surgery method so far – haemorrhoidectomy.

The Bispectral Index (BIS) is a processed EEG parameter measuring the specific effect of hypnotics and sedatives in brain. It is a derivation of EEG parameters such as frequency, amplitude and coherence, statistically related with the level of state of mind. It is

represented by a single number in the range between 0 and 100, where 0 means no brain activity and 100 is full consciousness. BIS does not measure the depth of anaesthesia (Kelley 2010). The goal of the total anaesthesia is to achieve hypnosis (sleep, no response to external signals), analgesy (lowered response to nociception impulses) and relaxation of the patient. Monitoring of “anaesthesia depth” would require monitoring of all three levels. However, the BIS monitors only the quality of hypnotic component, as its values correlate with the hypnotic substances concentrations. The advantages of BIS are in better balancing of analgetics and hypnotics dosing during anaesthesia. Currently, the BIS is gradually becoming standard for setting the “anaesthesia depth” for the adult patients.

Multi-centric studies proved that using the BIS for controlling sedation depth (hypnosis), i.e. in dosing modification of propofol, opiates or volatile anaesthetics brings several advantages, such as earlier awakening patient, lower use of anaesthetics, reduction of “awareness” risk during the general anaesthesia with relaxation, faster meeting of criteria required for discharge of patient from the PACU, or in our case, from the one-day surgery facility, lowered incidence of PONV and generally better quality of convalescence after the general anaesthesia.

MATERIALS AND METHODS

Our study was carried out on standard patients, whose surgeries were carried out by using the HAL-RAR method in one-day surgery in the period between October 2010 and August 2012. It was a standard anaesthesiology procedure of general as well as spinal anaesthesia. The file contains the total of 137 patients, 62 women and 75 men. The average age is 48.9 years (range 23–76); 23 patients (16.8%) were operated on in the general anaesthesia – 13 men (56.5%) and 10 women (43.5%) and 114 patients (83.2%) were operated in the spinal anaesthesia – 62 men (54.4%) and 52 women (45.6%).

Our goal was to find advantages of the general or spinal anaesthesia with focus on patients (subjective perception of pain after the surgery) as well as their safety. Moreover, we wanted to know how the dosage of analgetics would change after the surgery and also the possibility (the length of time after which it is safe to discharge the patient) to discharge the patient to the home care after the surgery. As the method is fairly

new and we did not have much experience with it, the patients stayed in the postoperative recovery room until the next morning, under the continuous supervision. In the study, we took into the account the theoretical possibility when the patient could be discharged into the home care with regard to vegetative stability, possibility to urinate and adequate tolerance of postoperative pain.

All patients were prepared for the surgery one day before using X-Prep (laxativum, senna fruit extract (*Sena acutifolia*)) to clean the bowels.

For all the patients, the pre-emptive analgesia was used – in case of the general anaesthesia before the surgery – 1 g of paracetamol p.o. 30 minutes prior to the surgery and in case of spinal anaesthesia, 1 g of paracetamol supp. p.r. towards the end of the surgery, instituted by the operator. The surgery was carried out in the gynaecologic position.

The general anaesthesia started by administration of sufentanil 5–10 µg i.v. and 1% propofol, dosage 1.5 mg/kg i.v., consequently, the laryngeal mask type I-gel was instituted, according to weight of the patient, continued by inhalation of sevofluran with MAC, the range approximately between 1.4 and 1.6, in the inhalation mixture of oxygen and air. According to the patient's reaction and the BIS value, there was bolus administration of analgetics sufentanil and 1% propofol i.v. On average, there was administered 10.0 µg of sufentanil (5–20 µg) and 140.9 mg of 1% propofol (60–240 mg). The BIS average value was maintained at 50 or even lower as for higher BIS values, maneuvering around the rectum area could cause possible slight patient's movements, as we didn't use myorelaxation and vegetative response in terms of tachycardia and hypertension. Moreover, the surgeon requested deeper anaesthesia for relaxation of sphincters for easier application of the anoscope probe. Generally, the surgeon is happier with the spinal anaesthesia as the patient is more relaxed and there is an easier access to the rectum.

The spinal anaesthesia was carried out while the patient was in the sitting position but there were some cases of patient's intolerance, manifested by tendency to collapse with possible bradycardia and hypotension, even at the subarachnoid area detection, before application of the local anaesthetic. In this case, the patient was placed in the position lying on the side and this way we were able to detect the subarachnoid area. For the spinal anaesthesia, we were using spinal needles size G26 (35 patients, 30.7%) and G27 (73 patients, 64.0%),

G27 with the pencil point tip type (2 patients, 1.8%) and only in 4 cases (3.5%) we used the spinal needle G25 for better identification of the subarachnoid area – for worse anatomic intervertebral areas. We used 0.5% levobupivacain. There were no toxic effects of the local anaesthetic noticed. The decrease of blood pressure was compensated by administering ephedrine in bolus doses, if there was only bradycardia present, we administered atropine, dosed by 0.1 mg/kg i.v.

During the surgery, the Ringer's solution was administered, 894.9 ml on average (ranging between 150 and 1,500 ml). The length of the surgery was 30.6 minutes on average (ranging between 10 and 55 minutes).

Consecutively, we were monitoring the time from the surgery until the first urination and stabilisation of the patient and time required to the first postoperative administration of analgetics. Overall, the values are as follows: Time required until the first urination, total 402.9 minutes (ranging between 155 and 845 minutes). We differentiated it for spinal as well as general anaesthesia. For the spinal anaesthesia, we counted time from administration of the local anaesthetics intrathecally and the average time was 399.8 minutes (ranging between 155 and 845 minutes). Only 6 patients had to be catheterized due to impossibility of spontaneous urination and bad tolerance – tachycardia, tendency to collapse and hypogastrium pain. The following urination was then spontaneous. For the general anaesthesia, the time was calculated from termination of the general anaesthesia until the first urination, the average result was 394.6 minutes (ranging between 165 and 725 minutes). Time required until the first postoperative administration of analgetics was also monitored postoperatively. The total average time was 313.5 minutes (ranging between 0 and 313.54 minutes). Again, differentiated for the spinal anaesthesia – 313.0 minutes (ranging between 0 and 625 minutes) and for the general anaesthesia, averaging 240.0 minutes (ranging between 20 and 525 minutes). Table 1 shows demographics, average weight, age, length of surgery and time required until the first urination and administration of analgetics.

Postoperative administration of analgetics was combination of analgetics such as metamizol, paracetamol, tramadol and in some cases also ibuprofen. One patient (0.7%), operated in the spinal anaesthesia, needed no analgetics. Others required 1 to 3 combinations of anal-

Tab. 1. Demographics, age and weight summary, length of surgery and time until the first urination and administration of analgetics.

	Men	Women	Age (years)	Weight (kg)	Length of surgery (min.)	Time until first urination (min.)	Time until first admin. of analgetics (min.)
General anaesthesia	13	10	49.6	74.3	25.7	394.6	240.0
Spinal anaesthesia	62	52	48.9	80.3	30.2	399.8	313.0
Total	75	62	48.9	80.4	30.7	402.9	313.5

getics. 1 analgetic was needed by 22 patients (16.1%), 14 (12.3%) after the spinal anaesthesia and 8 (34.8%) after the general anaesthesia. The combination of two analgetics was required by 96 patients (70.1%), 82 (71.9%) after the spinal and 14 (60.9%) after the general anaesthesia. The combination of three analgetics was administered to 18 patients (13.1%), 17 (14.9%) after the spinal and 1 (4.3%) after the general anaesthesia. Analgetics were not administered at the same time but gradually, according to the pain tolerance with specific time intervals. In total, metamizol (Novalgin) was administered in a dose averaging 0.9 g (0.9 g for spinal and 1.1 g for general anaesthesia), paracetamol (Paralen or Perfalgan) in a dose averaging 0.6 g (0.6 g for spinal anaesthesia and 0.5 g for general anaesthesia), tramadol (Tramal) averaging 45.5 mg (46.9 mg for spinal and 31.5 mg for general anaesthesia) and finally ibuprofen (Ibalgin) totally averaging 51.2 mg (56.1 mg for spinal anaesthesia, ibuprofen was not administered after the general anaesthesia). Analgetics after the general anaesthesia were preferably administered parenterally – intravenously or intramuscularly. After the spinal anaesthesia, the analgetics were administered perorally. Table 2 shows the amount of analgetics administered after the spinal and general anaesthesia within the post-operative analgesia.

DISCUSSION

Our study shows there is not a considerable difference between times until the first urination for the general versus spinal anaesthesia (394.6 min. vs. 399.8 min.) and for the time until the first administration of analgetics was approximately 70 minutes better for spinal anaesthesia (240.0 min. vs. 313.0 min.).

Jeong's study from 2011 states the length of the surgery using the HAL-RAR method at 34.0 minutes (in our study, the length of surgery is 30.7 min). Jeong *et al.* did not focus on the anaesthesia type, they were only comparing the effect of the surgery to the patient, whether from the point of painfulness – comparison of painfulness before and after surgery, re-convalescence and complications. The surgeries were carried out in general, spinal as well as local anaesthesia. The study was carried out on 97 patients (we were comparing 137 patients). Overall, the Jeong's study favours HAL-RAR method for the haemorrhoid surgery over the stan-

dard haemorrhoid surgeries due to the better effect on patient.

In 2005, Spencer *et al.* published the metaanalysis of randomised checked studies, where they were comparing the regional and general anaesthesia for the ambulatory sphere. The spinal anaesthesia decreased the score of pain and decreased the after-surgery use of analgetics (also the result of our study), however, it was not linked to the shortening of time until the discharge from ambulatory medical care, and, comparing with the general anaesthesia, there was the increase of time at the one-day surgery by 35 minutes. In our study, as the prerequisite for discharge from the one day surgery we used the time after urination, when we presumed the stabilisation of patient's state. In our study, this time was 394.6 minutes for the general anaesthesia and 399.8 minutes for the spinal anaesthesia proving the minimum difference between these processes for anaesthesia. Spencer's metaanalysis was comparing 22 studies with the total of 1,362 patients who underwent the surgery within the one-day surgery. They were not focused on one type of surgery, they included all possible surgeries in the fields of surgery, orthopedy, urology, and gynaecology. When comparing the results, our study is comparable with the above mentioned ones and we continue to carry it out and also we are trying to compare also other parameters of the patient's state.

CONCLUSION

Recently, the one-day ambulatory care has been getting into the know of medical community mainly due to budget-saving measures, as minor effective surgeries are preferably carried out at the one-day surgery and major and urgent surgeries are centralized into the specialized hospitals and centres. Gradually, it is also getting its place in the health care in Slovakia as well. Currently, the percentage of ambulatory surgeries in anaesthesia in Slovakia is 7%. For comparison, it is 87% in Canada, 55% in Denmark and 37% in Germany (Toftgaard 2007).

In the past, the spinal anaesthesia was not favourite choice for the ambulatory anaesthesia due to a prolonged effect and it caused the urinal retention. Presently, the new slim needle pencil point tip, use of thin calibres and greater experience with spinal techniques increase the use of subarachnoidal anaesthesia in the ambulatory conditions. Moreover, isobaric bupivacain or levobupivacain respectively, is more secure for old and high-risk patients than hyperbaric bupivacain (Firment 2008). If the anaesthesiologist follows the contra-indications of the spinal anaesthesia, the risk of harming the patient's health decreases to minimum. These days, techniques such as TIVA and the general inhalation anaesthesia with low gas flow can find the use within the ambulatory anaesthesia and it is down to the practices of the particular workstation and anaesthesiologist and of course, to instruction to the patient

Tab. 2. Average dose of postoperative analgetics.

	Metamizol (g)	Paracetamol (g)	Tramadol (mg)	Ibuprofen (mg)
General anaesthesia	0.9	0.6	46.9	56.1
Spinal anaesthesia	1.1	0.5	31.5	0.0
Total	0.9	0.6	45.5	51.2

and his/her approval to what type of anaesthesia would be chosen for the surgery.

Recently, the BIS monitoring has become very important part of the general anaesthesia, not only in medical centres of hospital type but also in larger private one-day surgery centres. On one hand, it decreases the risk of patient being awake during anaesthesia and surgery, this having also forensic reasons that give the anaesthesiologist possibility to defend himself. On the other hand, the BIS monitoring decreases the use of anaesthetics as the anaesthesia is balanced and “tailor-made” for the patient, which is important mainly in the private sphere of workplaces.

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