Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 21, issue 3, Jul.-Sep. 2011, pp. 525-532

SPINAL ANAESTHESIA VERSUS GENERAL ANAESTHESIA IN THE SURGICAL MICROAPPROACH OF LUMBAR DISC HERNIA

Maria Stoica[1*], Daniela Cernea[1], Luminița Chiuțu[1], Niculescu D[2], Purcaru F[1]
[1] Clinic of AIC, Universitary Emergency Hospital No.1 Craiova, University of Medicine and Pharmacy Craiova
[2] Clinic of Orthopedics and Traumatology, Universitary Emergency Hospital No.1 Craiova, University of Medicine and Pharmacy Craiova

ABSTRACT
OBJECTIVES. The authors' aim is to demonstrate the systemic impact of spinal anaesthesia compared with general anaesthesia in the minimal incision approach of lumbar disc hernia.
MATHERIAL & METHOD. There are studied two groups of patients, respectively: 22 patients who received general anaesthesia and 24 patients who received spinal anaesthesia; in both groups there were measured : clinical parameters (the time spent in PACU, the patient's satisfaction regarding the type of anaesthesia, the level of pain using VAS at 1, 6 and 12 hours, the passed time until the first analgetic request, total quantity of used analgetics, functional recovery, nausea, vomiting, urinary retention, number of days of hospitalization) and biological parameters: glycemia, serum cortisol, hGH.
RESULTS AND CONCLUSIONS. The results demonstrate the superiority of spinal anaesthesia in lumbar microdiscectomy with a high level of patient satisfaction and a good functional recovery.
KEYWORDS : lumbar disk hernia, discectomy, spinal anaesthesia, pain, endocrine stress

INTRODUCTION.

The purpose of this paper is that of attributing locoregional anaesthesia its place within lumbar spine surgery as there still are some hold-backs regarding this technique used in this type of surgery, despite the previously existing specialty articles.

MATERIAL AND METHOD.

Our research was performed within the Clinic of Orthopedics of the Emergency Hospital in Craiova, after having obtained the approval of the Ethics Committee and the informed consent. There were compared two anaesthetic techniques by measuring various physiological variables: post-aggressive response of the organism, post-surgical pain, functional recovery, patient satisfaction, hospitalization days, costs.

There were included 46 ASA I and II patients, diagnosed with lumbar disc hernia, between September 2008 and July 2009. The exclusion criteria were : history of heart diseases, blood dyscrasias, liver diseases, diabetes. The patients were randomly divided into two groups with the help of a computerized programme: the group that received general anaesthesia **(GA) – 22 patients** and the group that received spinal anaesthesia **(SA)-24 patients.**

	F	M
GA group (22)	10	12
SA group (24)	11	13

Table no.1.
Patient's gender distribution in both groups.

The surgical interventions were performed by the same team. Each type of anaesthesia was standardized. The patients in the GA group received pre-medication with Midazolam (3mg iv) and Atropine (0.5mg iv). The induction was performed with Thiopental (4mg/kg) and Succinilcoline (1mg/body kg), intubation being performed afterwards. Maintaining GA was performed with Fentanyl, Atracurium (0.3-0.4mg/kg) and Sevorane 1.5-2%.

In the SA patients, the lumbar puncture after skin infiltration with 3-4 ml Xyline 1% was performed with 25/26 G spinal needles with one or two levels above hernia disc place. In the subarachnoidian space there were injected 2.5-2.8 ml of Bupivacaine 0.5%+20 microg Fentanyl. The patients were positioned in ventral decubitus position after installing the spinal block. All the patients in the group were sedated intra-surgically operatively with Midazolam 2.5-5 mg or Propofol 0.5 mg/ body kg.

In both groups, during the surgical intervention, there were monitored: O2Sp, AV, AP, blood losses, patient's intra-surgical satisfaction level (in the SA group), duration of surgical intervention.

The pain level was evaluated quantitatively by using the Visual Analogue Scale (VAS) (Huskisson, 1983).

***Correspondence:** Tabaci Street, No. 1, 200642, Craiova, Dolj County, Department of Anaesthesia and Intensive Care
Tel: +40742052313; E-mail: alin.stoica76@gmail.com*

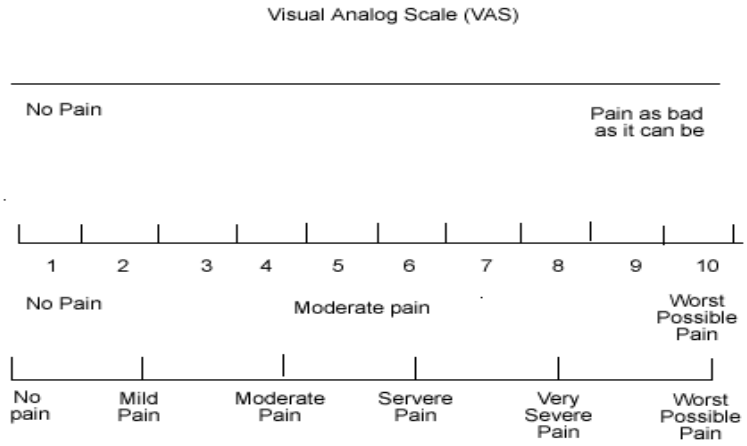

Figure 1. Visual Analog Scale (VAS)

The plasmatic Cortisol, the human growth hormone (hGH) and glycemia were determined pre-operatively and immediately post-surgery, within the same hour interval (Cortisol). At the end of the surgical intervention, the patients were repositioned in a dorsal decubitus position and they were transferred to the PACU (Post Anaesthesia Care Unit). For the post-operative analgesia there were administered Dexketoprofen 50 mg iv at 12 hours and Paracetamol 1g iv in PEV associated with Tramadol 50-100 mg upon request. Post-surgery, there were monitored: the time spent in PACU, the patient's satisfaction regarding the type of anasthesia, the level of pain by using a visual scale at 1, 6 and 12 hours, the time up to the first asking for analgesics, the total of used analgesics, functional recovery, nausea, vomitings and urine retention, number of hospitalization days.

Statistical analysis was made with statistical software MedCalc. Average was presented with standard deviation, and for comparation of means we used t test, and Fisher test, statistical significance were accepted for p values less then 0,05.

RESULTS

Glycemia was determined immediatley after surgery. As it may be observed from Chart 1, glycemia recorded close values in both groups (p=0,651). In patients receiving GA glycemia values (72,72±15,61 mg/dl) were with only 2,67% higher than patients from SA group (70,83±12,49 mg/dl).

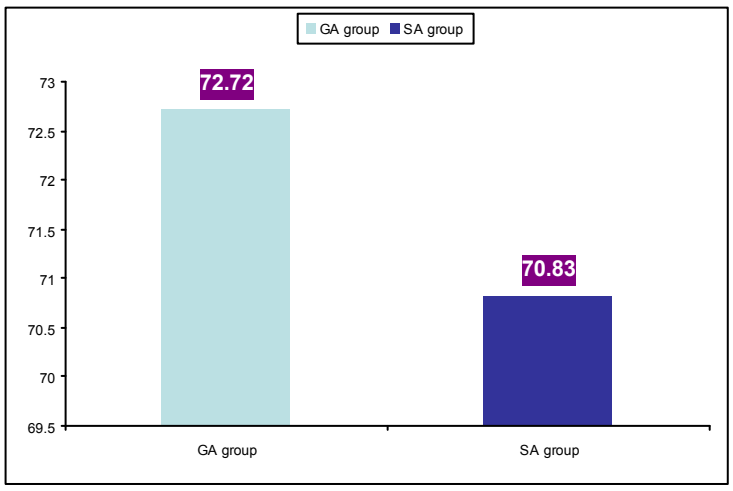

Chart 1. Postoperatory glycemia values in both groups.

Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 21, issue 3, Jul.-Sep. 2011, pp. 525-532

Medium level of postoperatory hGH (Chart 2), eas almost three times bigger (p<0,001) in patients from GA group (86,36±8,82) comparing with patients from SA group (29,16±5,74).

The same aspect was observed concerning the post-operative level of plasmatic Cortisol, presenting a medium value in GA group (81,81± 41,48 nmol/l) with over 50% bigger than value recorded in SA group (54,16± 28,74 nmol/l), the differences being statisticaly semnificative (p=0,011) (Chart 3).

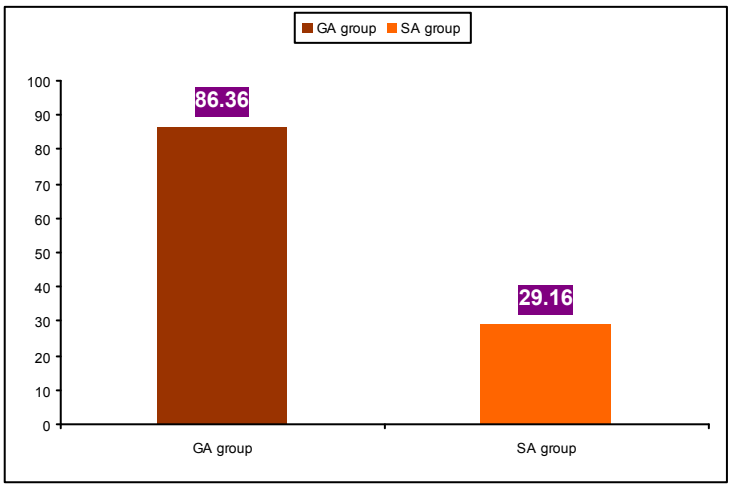

Chart 2. Postoperatory hGH values in both groups.

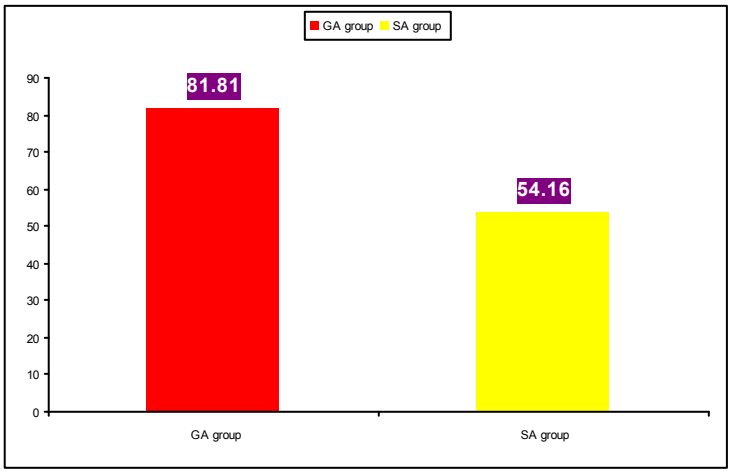

Chart 3. Postoperatory serum cortisole values in both groups.

In neither of the groups there was observed any major intra-anaesthetic incidents, the arterial hypotension (AT below 80 mmHg), present in 16% of the patients immediately after positioning them in a ventral decubitus position, was rectified after administering Efedrin and repositioning. It seems that the SA patients had a better haemodynamic stability after their positioning in a ventral decubitus position. Moreover, safely positioning SA patients was easier than that of GA patients who required a well-trained auxiliary personnel (curarised patient, IOT).

The duration of surgery was of 100±30 minutes with the same surgical team. The necessary for transfusions was absent in the SA group comparatively with the GA one (22.72%).

The time spent in the PACU of the SA group was of 1.8 hours and of 10.2 hours in the GA one. The time up to the first asking for analgesics was: approximately 3.2 hours in the SA group and 1.2 hours in the GA group.

As a consequence, the total of analgesics used was more reduced in the the SA group than in the GA one.

In the GA group, nausea and vomitings were more frequent (40.9%). Instead, in the SA group, the incidence of bladder ball was of 20.8%.

Post-surgery pain, using VAS, appeared after 1 hour, 6 hours and 12 hours, respectively. In Charts 4 and 5 it may be observed that in the SA group only 4.16% of the patients indicated severe pain (VAS), unlike 45.44% of the patients in the GA group (p=0,015).

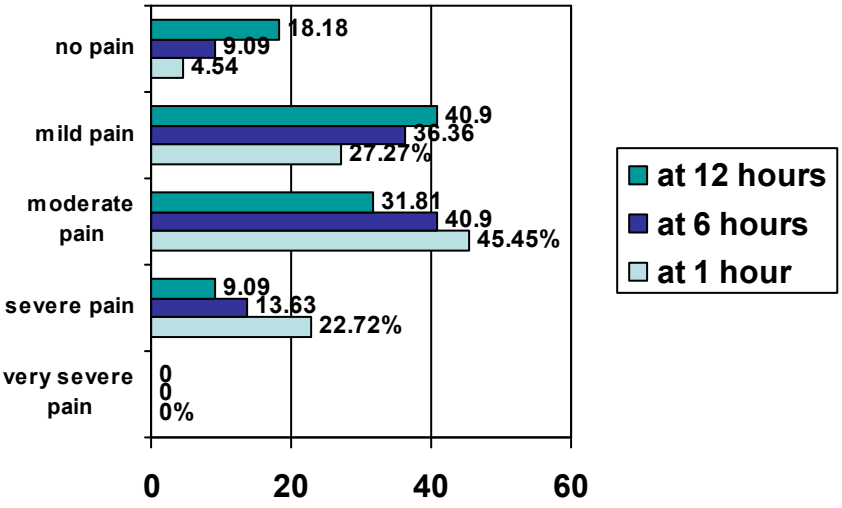

Chart 4. Pain distribution in GA group.

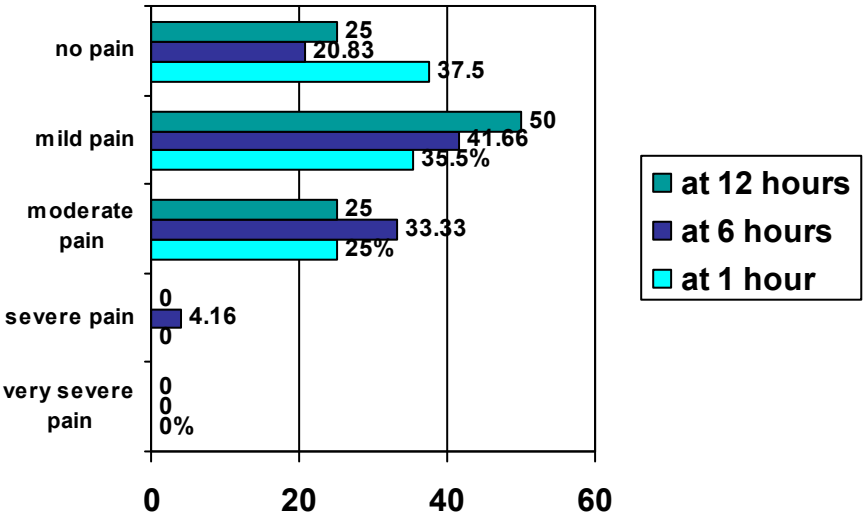

Chart 5. Pain distribution in SA group.

Regarding the perception of pain in the studied groups, according to sex, there are no significant differences after 1 hour post-surgery (p=0,183), but, after 6 hours (p=0,0391) and 12 hours (p=0,054), respectively, a high percentage of male patients indicated values over 5 on VAS (see Charts 6 and 7).

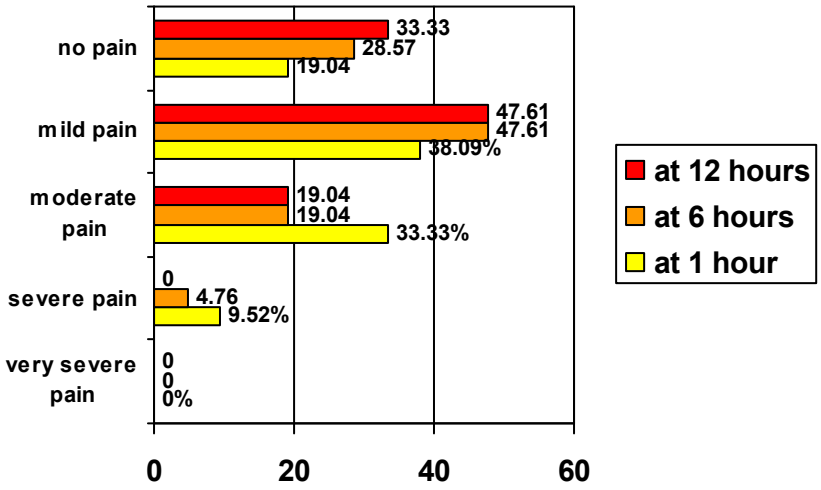

Chart 6. Pain distribution in female patients.

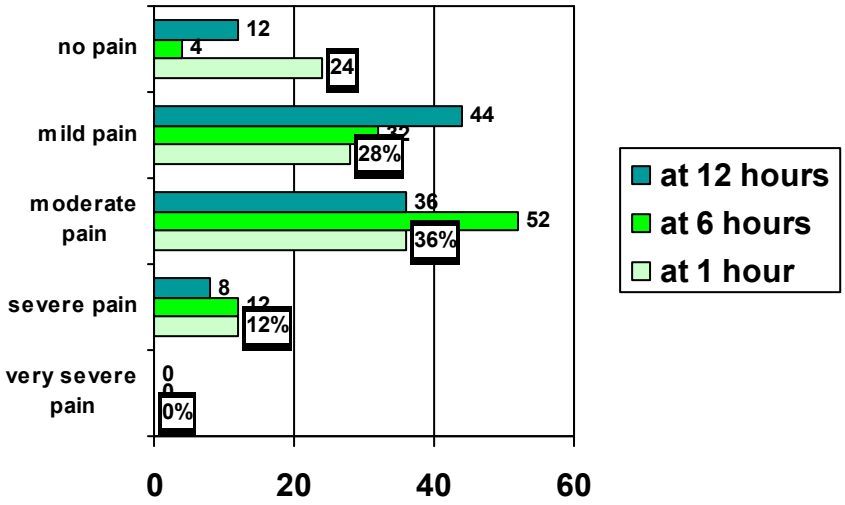

Chart no. 7. Pain distribution in male patients.

The level of intra-surgical satisfaction. In the SA group, 76.92% of the male patients required additional sedation in comparison to only 18.18% of the female patients (p=0,028).

Functional recovery. An important aspect within our study, it was influenced by various factors. In the SA group, the communication and early interaction with the medical staff as well as with the family led to a better acceptance of the post-surgery status, to an early mobilization and a discharge approximately 1 day earlier. Regional anaesthesia with local anaesthetic agents inhibits the stress response to surgery and can also influence postoperative outcome by beneficial effects on organ function (Desborough, 2000). According to some authors (Baylot et al., 2009), loco-regional anaesthesia seem to reduce the risk of postoperative chronic pain occurance.

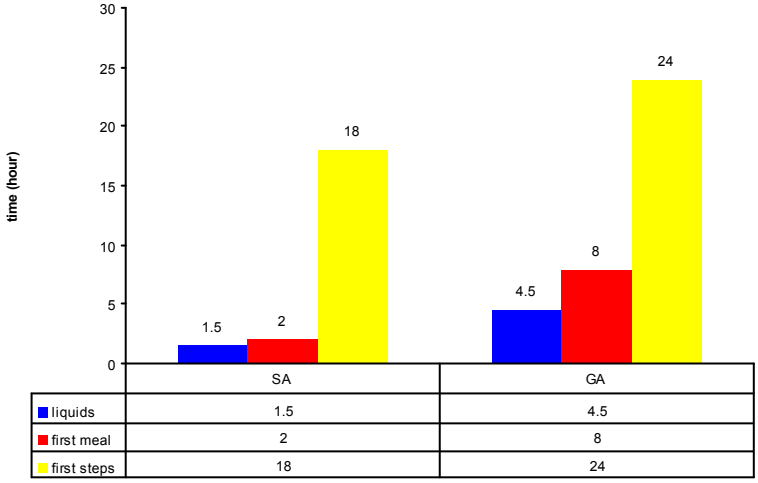

Chart 8. Patients satisfaction in SA group comparing with GA group.

DISCUSSIONS

Lumbar disc hernia, a stage during the evolution of degenerative disc disease, represents another medical interdisciplinary challenge (orthopedist, neurologist, rheumatologist, etc.), the importance of this rachidian degenerative pathology being supported by premises like:

- An extremely high incidence of the basic etiological affection (lumbar discopathy over 40%) (Elena Copaciu, 2006).
- Prevalence of compressive stage within the professionally active population imposes a rapid solution for adequate recovery and reintegration.

The objective of the surgical intervention, performed in the cases that were rebel to a conservatory treatment, is to extract the herniated disc material from the vertebral channel, thus releasing the 'noble neurological' elements. The classical surgical method used was laminectomy, an extensive surgery with a large exposure of the vertebral channel. The modern surgical method, minimally invasive, consists of the interlamellary approach, the intrusion in the vertebral channel without any major bone or ligament sacrifice (preserving the rachidian stability), this implicitly leading to a rapid recovery of the patient, with no late post-surgical complications (spindilolisthesis, secundary stenosis) (Gotfryd et al., 2009). When there are not present any associated diseases and the patients are cooperative, the duration of anesthesia within this medical technique is less than 90 minutes. In general, patients would prefer general anaesthesia (GA) during the surgical act, due to the loss of conscience. General anaesthesia may limit he perception of sensations due to injury, but does not abolish the reponse completely as hypothalamus reacts to the noxious stimuli even in the deeper planes of anaesthesia (Singh, 2003). Still, rachianaesthesia proved to be good, if not better, than GA, in the case of lumbar microdiscectomy and when it is IV potentiated, the patient's acceptance is an easy one (Fischer, 2009). All the intravenous agents and volatile anaesthetics in normal doses have minor influence on the endocrine and metabolic functions (Velickovic et al., 2002).

Glycemia. The two hormones directly regulating the level of blood glucose are Glucagon and Insulin. Glucagon accelerates the conversion of glycogen into glucose, thus determining glycemia increase. Glycemia determination is made by a spectrophotometrical method, with normal values of 60-110 mg/dl. Intense physical effort may generate hypoglycemia increases after anaesthesia, surgical intervention ("stress hyperglycemia") (Bagry et al, 2008) (Ouattara, 2009).

Growth Human Homone (hGH). It is secreted as a response to effort, stress, anxiety, deep sleep, hypoglycemia, glucanon, insulin, thyroid homones. The hormone determination may be performed both under basic circumstances and after stimulation as well (physical effort, arginine, glucanon or insulin) or supression (after administering 100g glucose). The detection method is by chemiluminiscence. Normal values: in women < 10 ng/ml and in men <5 ng/ml.

Seric Cortisol. It is the most important glucocorticosteroid and it is essential in maintaining various functions of the organism. It has an anti-inflammatory and immunosupressive action, interfering with the increase of glycemia. Stress determines the increase of cortisol secretion. The seric concentration of cortisol presents a daylight variation. The maximum concentrations are registered in the morning (171-536 nmol|l) and the minimum ones between 16 and 20 in the afternoon (64-327 nmol/l).

Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 21, issue 3, Jul.-Sep. 2011, pp. 525-532

The results of our study (See Charts 2 and 3) are in accordance with other studies stating that regional anaesthesia may ocasionally reduce and even abolish the neuroendocrine response in surgical interventions (Moore et al., 1994).

Regarding the patient's satisfaction about the type of anaesthesia, this is essentially influenced by a pre-anaesthetic evaluation of patients, indentifying those with high vulnerability to any kind of medical procedures (Hall, 1985). In this case, general anaesthesia is preferred. Also, other social aspects are important, such as: the patient's origin environment, instruction level, family support, possibility of pre-surgery information regarding the type of anaesthesia, medical history (for example other minor or medium interventions that he had previously suffered and the type of anaesthesia used during those interventions: herniorrhaphy, appendectomy, etc.) (Cedraschi et al., 2006).

Feeling pain (VAS), after one hour post-surgery, at values lower than 4 in a high number of SA patients, in comparison to GA ones, was probably due to maintaining a sensitive block obtained by SA.

A study of Dagher et al (Dagher at al.,2002) underlined once more the fact that in SA patients functional recovery is faster, having a better pain scale. In a different study, McLain at al (McLain et al., 2005) concludes that the potential advantages of spinal anaesthesia within lumbar column surgery include: low duration of anaesthesia, a reduced necessary of antiemetics and analgetics, fewer complications.

In comparison to the study of Perez (Perez et al., 2007), in our study there existed significant differences regarding the perception and level of pain in both sexes (see Charts 6 and 7). The presence of differences, due to hormonal and behaviour parameters between sexes, has been acknowledged for a long time. There was described an autonomous reactivity, mainly sympathetic in men and parasympathetic in women. Clinically, this is translated by a high cardiovascular response in men (Tousignant-Laflamme, 2009). There was also noticed that sexual hormones play an important part in cardiac regulation in women (Liu et al., 2003). Zubieta et al showed that sexual hormones have analgesic properties: when a high level of estrogens is present, the activation of the opioidergic endogenous system involves hypoalgesia (Smith et al., 2006).

Perez (Perez et al., 2007), in the same study mentioned above, notes that a high rate of post-surgery urinary retention is the effect of using Morfin intrathecally, although in the SA group in our study an opioid (Fentanyl) was also used intrathecally (20.8%).

CONCLUSIONS

The obtained results show that rachidian anaesthesia, although very little used in lumbar column surgery, is more preferred than general anaesthesia, where possible. To support this statement, we count on the following facts:

- a better endured surgical stress
- a simpler intervention logisitcs, with lower costs
- a simper post-surgery therapy
- more rapid functional recovery and social reintegration
- in well-selected patients, the level of satisfaction is high
- a more reduced hospitalization period.

REFERENCES

Bagry HS, Raghavendran S, Carli F, Phil M. Metabolic syndrome and insulin resistance. Perioperative considerations. Anaesthesiology; 108(3);506-23, 2008.

Baylot D, Navez ML. Place des blocs analgesique dans la prevention de la douleur chronique postoperatoire. Doul. et Analg.; 22(1):26-29, 2009.

Cedraschi C, Allaz A-F. Les lombalgies et leur prise en charge chirurgicale: le role des facteurs psychosociaux. Doul et Analg., 19(3):55-58, 2006.

Copaciu Elena. Actualitati in managementul durerii lombare. Revista Durerea, Nr. 2, 2006.

Dagher C, Naccache N, Narchi P, Hage P, Antakly M-C. Anesthesie locoregionale pour cure microchirurgicale des hernies discales lombaires. Journal Medical Libanais 50 :206-210, 2002.

Desborough JP. The stress response to trauma and surgery. Br. J. Anaesth. 85 (1):109-117, 2000.

Fischer B. Does regional anaesthesia improve outcome?. Anaesthesia & Intensive Care Medicine 10 (11)545-548, 2009.

Gotfryd A, Avanzi O. A systematic review of randomised clinical trials using posterior discectomy to treat lumbar disk herniations International Orthopaedics (SICOT); 33(1);11-17, 2009.

Hall GM. The anaesthetic modification of the endocrine and metabolic response to surgery. Anals of the Royal Colege of Surgeons of England, 67(1):25-9, 1985.

Huskisson EC. Visual analogue scales. In: Melzack R, editor. Pain measurement and assessment. New York: Raven Press;. p. 33-37, 1983.

Liu CC, Kuo TB, Yang CC . Effects of estrogen on gender-related autonomic differences in humans. Am J Physiol Heart Corc Physiol 285 (5):H2188-H93, 2003.

McLain RF, Kalfas I, Bell GR. Comparison of Spinal and General Anesthesia in Lumbar Laminectomy Surgery : A Case-Controlled Analysis of 400 Patients. J Neurosurg : Spine, 2(1):17-22, 2005.

Moore CM, Dersbrough JP, Powell H, Burrin JM, Hall GM. The effects of extradural anaesthedia on interleukin-6 and acute phase response to surgery. Br J Anaesth 72(3):272-9, 1994.

Ouattara A. Le controle glycemique en perioperatoire. Annales Francaises d' Anesthesie et de Reanimation 28(5); e217-e219, 2009.

Perez JR, Tambe A, Dua R, Pereda E, Calthorpe D. Spinal or General anaesthesia for lumbar spine microdiscectomy Surgery...does it matter ? The internet Journal of Spine Surgery, Volume 3 (2); 2007.

Smith YR, Stohler CS, Nichols TE, et al. Pronociceptive opiod and antinociceptive effects of estradiol through endogenous opiod neurotransmission in women. J Neurosci; 26(21):5777–578, 2006.

Singh M. Stress reponse and anaesthesia altering the peri and post-operative management. Indian J. Anaesth; 47(6):427-434, 2003.

Tousignant-Laflamme Y. Une revue sur les differences entre les hommes et les femmes au niveau de la reactivite autonomique a la douleur. Douleur analg. 22(3):152-156, 2009.

Velickovic I, Yan J, Gross JA. Modifying the neuroendocrine stress response. Seminars in Anaesthesia, Perioperative Medicine and Pain; 21(1), 16-25, 2002.