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Effect of Preoperative Feeding on Gallbladder Size and Peristaltic of the Small Bowel Following Spinal Anesthesia for the Hip Surgery

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ABSTRACT

The main aim of our study was to determine the influence of preoperative feeding with clear carbohydrate rich drink (PreOp 200 mL) on peristaltic of the small intestine and gallbladder size early after the orthopedic surgery in spinal anesthesia. Clinical study includes 120 patients with fracture of femoral neck or pertrochanteric fracture. All patients were randomized in two groups, sixty patients, PreOp group, consumed carbohydrate drink two hours before surgery. Other 60 patients, Control group, represent patients who fasted overnight. After surgery, patients were submitted to ultrasound examination for measurement of the small bowel motions and gallbladder size. Four quadrants (up-right, up-left, down-right and down-left) of the abdomen were examined, each one in duration of 30 seconds. The results show that the length of the gallbladder is considerably different across the two groups; 5.866 cm in the PreOp group and 7.178 cm in the Control group ($p=0.00$). The width, however, differed somewhat less (PreOp group 2.437 cm, Control group 2.735 cm) and the statistically significant difference can be observed at 7% level ($p=0.073$). We found no statistically significant relationship between PreOp and Control group variables of each abdominal quadrant (lowest $p>0.087$). Accordingly, the means of the variables were found statistically significantly different between groups ($p>0.05$). In conclusion our study showed that the preoperative feeding of the patients undergoing orthopedic surgery in spinal anesthesia shortens the length but not the width of the gallbladder when compared with overnight fasting patients and also clearly enhance motility of the small bowel in all four quadrant of the abdomen.

Key words: preoperative feeding, peristaltic, small bowel, gallbladder size, spinal anesthesia and orthopedic surgery

Introduction

Overnight fasting, as a standard for elective surgery, has a strong negative influence on the postoperative recovery. Some recent studies evidence a loss of skeletal muscle mass during the postoperative period as a result of starving before elective surgery¹. Decreasing of the jejunal activity after fasting was demonstrated on the animal model using B mode and Doppler ultrasonography². Other studies show that 300 mL of sweetened carbonated beverage does not modify the physiology of the upper digestive tract including gastric emptying and gallbladder contractility³. A patient feeding with pure carbo-

hydrate enriched drinks, two hours before surgery, does not increase the risk of gastric content aspiration^{4,5}. Decreasing level of anxiety and thirstiness during the preoperative period is another benefit of the preoperative feeding⁶. Therefore this preoperative feeding protocol has been suggested as safe and beneficial for patients. The goal of our study was to determine the influence of preoperative feeding with pure carbohydrate enriched drink (PreOp 200 mL) on peristaltic of small intestine and gallbladder size early after the orthopedic surgery in spinal anesthesia.

Materials and Methods

This prospective clinical study includes 120 patients with fracture of femoral neck or pertrochanteric fracture from Department of Traumatology. They were scheduled for implantation of endoprosthesis of the hip joint in spinal anesthesia. All patients in this study were randomized in two groups and classified as ASA II and III. They were assigned for the semi-elective surgery next morning according to the hospital protocol. The excluding criteria were: patients graded as ASA IV and V, general anesthesia, gastrointestinal diseases, previous gastric, duodenal or small bowel surgery, previous cholecystectomy, pregnancy, the use of drugs that affect small bowel motility and gallbladder contractility, allergic reaction to bupivacain, rescue analgesia with opioids and those patients who had vomited in preoperative period. Hospital ethical committee approved the study, and the subjects gave their informed consent before entering the study. There were two groups of patients, sixty patients were in PreOp group and consumed carbohydrate drink »PreOp« (NUTRICIA, Netherlands) 200 mL two hours before surgery. Other 60 patients, selected as a Control group, represent patients who fasted overnight. Carbohydrate drink »PreOp« in 100 g contains: 50 kcal, proteins 0 g, sugar 12.6 g, and fat 0. Spinal anesthesia was performed on all patients (bupivacain 0.5%+Glucose 50%) with 26 Gauge needle at the level of L2/L3 or L3/L4 vertebrae. During the preoperative preparation all patients received 7.5 mg of the midazolam for sedation according to the hospital protocol. After surgery, the patients went in the recovery room for the ultrasound examination of small bowel motions and gallbladder size. Four quadrants (up-right, up-left, down-right and down-left) of the abdomen were examined by using B mode and Doppler ultrasonography and during 30 seconds we considered peristaltic presented or absent. After that, we measured long and short axis (three times per each) of the gallbladder with same ultrasound probe. Anesthesiologists who did not participate in process of the collecting data or results evaluation performed anesthesia. Researchers who perform examination of the small bowel motility and measurements of the gallbladder did not participate in anesthesia or evaluation of the results. We used ultrasound scanner (Aloka SSD-3500, Aloka, Tokyo, Japan) with a micro convex transducer (3.5–5 MHz). Experienced anesthesiologist (AP) performed all procedures.

Statistical analysis

Age, extent of spinal block and complications of both groups are presented as median with 10th–90th percentile range, since the data were not distributed normally. The level of significance, *p*, was determined by Kruskal-Wallis ANOVA. Frequencies were tested by Fisher exact test.

Four variables of the PreOp and the Control groups, in all four quadrants, were examined by means of a Pearson chi-square Test and a similar Fischer's Exact Test. Fischer exact test was used as a replacement for the Pearson chi-squared test where the frequency of the expected counts was lower than 5. Equality of means of four variables was examined by a two-sample t-test. The differences in length and width of the gall-bladder in persons belonging to the PreOp and the Control group was examined with a non-parametric Spearman correlation coefficient and two-sample t-test. 5% level of certainty was used throughout. The analysis was performed in statistical software STATA10 for Windows.

Results

The study was completed with 110 patients (120 patients entered the study); seven of them were excluded due to general anesthesia, followed by unsuccessful spinal anesthesia and other three patients vomited in early postoperative period due to the randomization of the patients in two groups (56 patients for PreOp group and 54 patients for Control group). Groups were comparable in gender, age and number, extension of the spinal block and all this parameters showed no significant difference between two groups (Table 1). Hypotension was one of the most often complication that occurred in both groups, but the frequencies were not statistically significant (Table1).

The length and the width of the gall bladder in the PreOp group were not correlated to the length and the width of the gall bladder in the Control group ($p > 0.05$). A similar finding stems from the t-test where the means of the two variables, compared between the PreOp and the Control group, are statistically different. The length of the gall bladder is considerably different across the two groups; 5.866 cm in the PreOp group and 7.178 cm in the Control group ($p = 0.00$). The width, however, differed somewhat less (PreOp group 2.437 cm, Control group

TABLE 1
PATIENT CHARACTERISTICS AND PREOPERATIVE DATA COMPARISON OF TWO GROUPS

| Group | 1 | 2 | <i>p</i> |
|--------------------------------------|--------------|-----------------|----------|
| Number of patients | 56 | 54 | |
| Gender (M:F) | 14:42 | 12:42 | 0.731 |
| Age / years | 81 (68–91) | 81 (66–88) | 0.880 |
| Extent of the spinal block / min | 120 (95–180) | 117.5 (100–160) | 0.407 |
| Complications – hypotension (yes:no) | 26:30 | 16:38 | 0.081 |

* p -value < 0.05 was considered to be statistically significant

TABLE 2
ULTRASOUND MEASUREMENT OF LENGTH AND THE WIDTH OF GALLBLADDER IN PREOPERATIVE FED (PREOP GROUP) AND FASTED GROUP (CONTROL GROUP). ALL VALUES ARE PRESENTED AS MEAN WITH STANDARD DEVIATION

| | PreOp group | Control group | *p |
|--------------------------------|-------------|---------------|---------|
| Length of the gallbladder (cm) | 5.866±1.10 | 7.178±1.36 | p=0.001 |
| Width of the gallbladder (cm) | 2.437±0.65 | 2.735±0.90 | p=0.07 |

2.735) and the statistically significant difference can be observed at 7% level (p=0.073) (Table 2).

The Pearson chi-squared and Fischer Exact Test show that the four variables of each abdominal quadrant are independent and statistically different at 5% level of certainty. In other words, we find no statistically significant relationship between PreOp and Control group variables of each abdominal quadrant (lowest $p > 0.087$). Accordingly, the means of the variables were found statistically significantly different between groups ($p > 0.05$) (Table 3).

TABLE 3
ULTRASOUND VISIBLE SMALL BOWEL MOTILITY COMPARING THE SAME QUADRANTS OF THE PATIENT'S ABDOMEN IN PREOPERATIVE FED (PREOP GROUP) AND FASTED GROUP (CONTROL GROUP)

| PreOp group : Control group (quadrant*) | 1:1 | 2: 2 | 3:3 | 4:4 |
|---|---------|---------|---------|---------|
| Ultrasound visible small bowel motility | 63%:13% | 77%:57% | 90%:60% | 80%:43% |
| p** | 0.13 | 0.66 | 0.35 | 0.09 |

* 1 – up-right, 2 – up-left, 3 – down-right, 4 – down-left

** Chi-squared and Fischer Exact Test results. $p > 0.05$ was considered statistically significant

Discussion

Through this study we want to answer on two questions: does preoperative feeding with carbohydrate enriched drink has influence on gallbladder size early after surgery undergoing spinal anesthesia and what happens with motility of the small bowel in the same postoperative period?

The reason why we want to encourage enhancing a protocol of the preoperative feeding in our hospital is to

preserve skeletal muscles and to stimulate better recovery^{1,7}. Two hours is physiological gastric emptying time after drinking water or clear carbohydrate enriched drink, therefore there is very low risk (even if the patients have to be converted in general anesthesia) of gastric content aspiration⁴. A fat hydrolysis is essential in the regulation of the gallbladder contraction, but recent studies showed that high carbohydrate diet decreases gallbladder volume^{7,8}. An early postoperative enteral nutrition after the mayor adult surgery diminishes the volume and probably stimulates the motility of the gallbladder⁹. Influence of the preoperative feeding with carbohydrate enriched drink on size of the patients' gallbladder early after spinal anesthesia till now has not been investigated. Postoperatively, some patients reduce the bowel activity, which causes accumulation of secretions and gas, resulting in nausea, vomiting, abdominal distension, and pain. This prolonged inhibition can take days or weeks and can lead to the postoperative paralytic ileus¹⁰. Regarding postoperative motility disorders it is presumed that resumption of oral food intake shortens the length of stay in hospital because early postoperative food intake stimulates small and large bowel motility via interenteric reflex arches^{11–13}. Therefore, we presumed that preoperative feeding of the patients could have positive effect on the postoperative bowel activity, but we were not sure about prolonged effect of the spinal anesthesia on small bowel motility.

Finally, our study showed that the preoperative carbohydrate enriched drink feeding of patients undergoing spinal anesthesia shortens the length but not the width of the gallbladder in early postoperative period when compared with overnight fasting patients.

Some limitations of this study could be respiratory movements of the diaphragm which may interfere with ultrasound estimation of the small bowel motility. However, our results clearly show considerable differences between the motility of the small bowel in the preoperative fed patient and the fasted patients in control group, i.e. the variables of each quadrant appear independent across groups. Future measurements and replications of the experiment will add to the precision of our estimates.

In conclusion, we point out that preoperative feeding of the patients, with pure carbohydrate enriched drink partially affects on gallbladder size but clearly enhance motility of the small bowel in all four quadrants of the abdomen of the patient undergoing spinal anesthesia.

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UTJECAJ PRIJEOPERACIJSKOG HRANJENJA NA VELIČINU ŽUČNJAKA I PERISTALTIKU TANKOG CRIJEVA NAKON SPINALNE ANESTEZIJE KOD OPERACIJE KUKA

SAŽETAK

Glavni cilj ove studije jest istražiti utjecaj prijeoperacijskog hranjenja bistrim napitkom obogaćenim ugljikohidratima (PreOp 200 mL) na peristaltiku tankog crijeva i veličinu žučnjaka nakon ortopetske operacije kuka pod spinalnom anestezijom. U studiju je bilo uključeno 120 pacijenata sa prijelomom vrata femura ili s pertrohanternom frakturom. Pacijente smo randomizirali u dvije skupine; jedna je skupina prijeoperacijski hranjena, a druga ne. Postoperativno, u obje je skupine izvršen ultrazvučni pregled veličine žučnjaka i peristaltike crijeva i to u sva četiri abdominalna kvadranta (desno i lijevo gore te desno i lijevo dole) u trajanju od 30 sekundi. Rezultati pokazuju da se dužina žučnjaka značajno razlikuje između dvije skupine (5.866 cm u PreOp skupini i 7.178 cm u kontrolnoj skupini, $p=0.00$) dok širina nešto manje (2.437 cm u PreOp skupini i 2.735 cm u kontrolnoj, $p=0.073$). Peristaltika se značajno razlikuje u sva četiri kvadranta (Chi kvadrat test $p>0.087$; t-test $p<0.05$). Zaključno, ova je studija pokazala da prijeoperacijsko hranjenje pacijenata koji se podvrgavaju operaciji kuka pod spinalnom anestezijom skraćuje dužinu žučnjaka te povećava motilitet tankog crijeva u sva četiri abdominalna kvadranta.