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A 48-HOUR PROFILE OF INTRA-ABDOMINAL PRESSURE FOLLOWING RESECTION OF THE RECTUM

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Abstract

The aim of our research was to describe the characteristics of the intra-abdominal pressure curve following elective rectal resection in the first 48 hours after the operation. We wanted to prove the hypothesis that intra-abdominal pressure rises within 48 hours after the procedure and correlates well with the postsurgical bowel paralysis. We evaluated the relationship of the maximal intra-abdominal pressure to the body mass index and to precisely defined width of anastomosis. The intra-abdominal pressure was measured indirectly at intervals of 4 hours. The statistical evaluation was made by means of regression analysis at 5% significance level. We compared dependent variable curves of intra-abdominal pressure in 24 patients. We proved that intra-abdominal pressure within the first 48 hours following the procedure rises and can thus be accepted as objective correlation to postsurgical bowel paralysis. We proved dependence of the maximal intra-abdominal pressure level on the body mass index and independence on a diameter of anastomosis of 21–33 mm. We would like to use our findings further for evaluation of the influence of early enteral feeding on postoperative bowel paralysis after elective rectal resection.

Key words

Postoperative bowel paralysis, Intra-abdominal pressure, Rectal resection

INTRODUCTION

Postsurgical bowel paralysis is a ceased bowel activity due to impaired function of nerve endings. It is found after retro- and sometimes even extraperitoneal procedures. Most probably, its origin is an afferent reflex following peritoneal injury (*1*). This theory seems to be supported by the varying periods of postoperative paralysis which is minimal after laparoscopic and longer after laparotomic procedures. From the physiological point of view, peristalsis begins on the small and later on the large intestine. References state that postsurgical paralysis is the longest after colon interventions and reaches 48–72 hours (*1*).

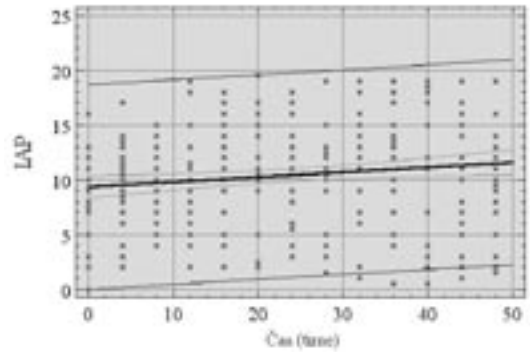

Fig. 1
Correlation between intra-abdominal pressure and time

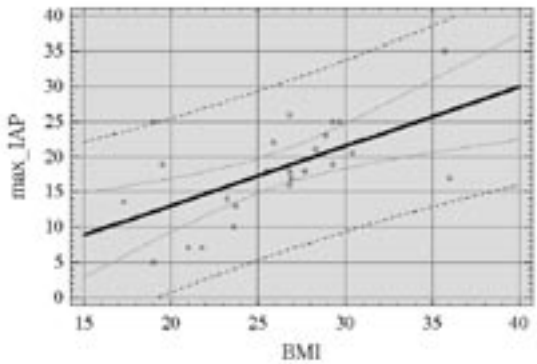

Fig. 2
Correlation between maximal intra-abdominal pressure and body mass index

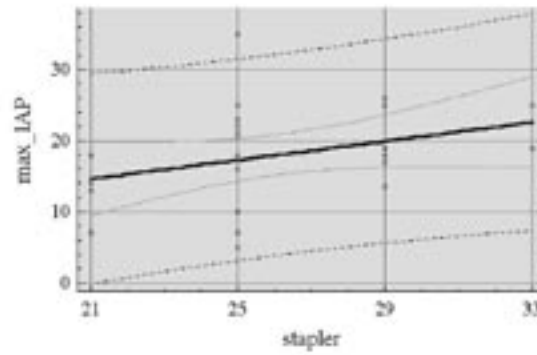

Fig. 3
Correlation between maximal intra-abdominal pressure and diameter of stapler used

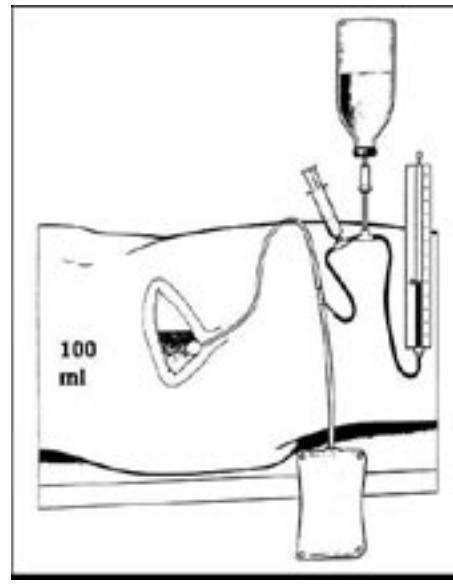

Fig 4
The measurement of IAP

In regard to postoperative paralysis we are facing many questions that are only partially solved. We have to give full credit to the far-reaching sentence of the British physicist, Lord Kelvin, who said that if we wanted to describe an entity, we have to measure it first. The diagnosis of postoperative paralysis consists of a history of feeling tension and pain in the belly, observation revealing abdominal distension and rise above the thoracic niveau, percussion with tympanal echo over the distended intestine, palpation with stretched abdominal wall, and on auscultation there is silence. The varying degree of "quantity" of postoperative paralysis is mirrored not only in the varying extent of physical symptoms, but there are also other complementary examinations that show varying extent of subtle to severe changes. These examinations, describing paralysis with greater or lesser sensitivity, include meteorism and hydroaeric phenomena on X-rays, intestinal motility followed on ultrasound, the velocity of food passage traced by radioisotopes (rice), and measurements of the presence or qualitative changes of migrating myoelectric impulses.

The relationship of postoperative paralysis and measurements of intraluminal pressure (anorectal and gastric tonometry) still remains a controversial issue. The importance of the time of the first flatulence (very subjective) and passing of the first stool (may be just an emptying of distant GIT) is only marginal. The above said shows that postsurgical paralysis still lacks a determinant that would clearly quantify it and prove its passing.

We have suggested a hypothesis that the physical determinant that could fulfil such requirements is the intra-abdominal pressure (IAP). The factors that falsely

increase pressure in the hollow organs must be kept in mind and eliminated. These include increased thoracic pressure (*7*), retroperitoneal pressure, abdominal wall muscle contractions, fluid collections inside abdominal cavity, or intraluminal obstruction of the GIT.

Our secondary aim was to evaluate the relationship of the maximal value of IAP to the body mass index and the size of the utilized stapler (21–33 mm).

METHODS

IAP was measured in 26 patients who underwent rectal resection and who had the anastomosis made by a stapler. We used indirect measurements, i.e. measuring the pressure in the urinary bladder after filling it with 100 ml of isotonic solution (*Fig. 4*). Normal values of IAP following elective operations are 5–12 cm H_2O, a range of 15–25 cm is regarded as increased, and values above 25 cm are considered markedly pathological and equivalent to an abdominal compartment syndrome (ACS) (*2, 6*). We selected this method as it seems to correlate consistently with direct measurements of intra-abdominal pressure in contrast to other indirect methods such as pressure measurements in the stomach, rectum or inferior vena cava (*4*). We took the examinations in 4-hour intervals for 48 hours because, first, this is the time period when we will try to influence postsurgical paralysis by early introduction of enteral feeding in the near future, and, secondly, this is the usual time when patients after rectal or rectosigmoid interventions require a urinary catheter. We selected patients after rectal surgery due to difficulties and time needed for renewal of their peristalsis as described above. Prior to every measurement, careful elimination of all possibly disturbing factors was observed. We included only patients who underwent a successful orthograde preoperative preparation to eliminate the risk of postsurgical bowel obstruction by stool remnants. The patients involved had to be breathing spontaneously, without artificial ventilation; if they coughed, the measurements were disregarded and repeated, postoperative pains had to be pharmacologically managed so that VAS would be within a 3–4 range. As a rule, the abdominal cavity had to be effectively drained (*5*). Statistical evaluation was done by means of regression analysis at 5 % significance level. We also monitored how many patients exceeded the limit of 15 cm H_2O on more than two occasions. Next, the time of peristalsis onset was noted by auscultation and by the first passage of gases and stool.

RESULTS

The medians of the peristalsis onset were 3 days, of the first passage of gases 4 days, and of stool 5 days. Statistical comparison of intra-abdominal pressure dependence curves revealed an increase of IAP within the first 48 hours and IAP thus presents an objective correlate to postsurgical paralysis (*Fig. 1*). We proved that the maximal values of intra-abdominal pressure depend on the body mass index (*Fig. 2*) and are independent of a width of anastomosis of 21–33 mm (*Fig. 3*). Pressures over 15 cm H_2O were noted in 64 % of patients. On such pressure levels, passage of gases and stool resulted in an IAP drop while this effect was not observed in a normal pressure range (i.e., under 15 cm H_2O). The 48-hour curve of abdominal pressures followed closely clinical symptoms of postoperative paralysis and, in several cases, all of them being at pressures over 15 cm H_2O, paralytic ileus. In all cases peristalsis commenced spontaneously and no revision was necessary.

CONCLUSIONS

The intra-abdominal pressure measurement seems to be the only easily available objective correlate to the degree of bowel paralysis in patients following elective rectal resection, who have no important risk factors or in whom these factors were eliminated. The body mass index then remains as the major influencing factor.

In practice, we would like to use this finding to establish the efficacy of an early introduction of enteral feeding via a three-way nasojejunal tube (*3*).

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48HODINOVÝ PROFIL NITROBŘIŠNÍHO TLAKU PO RESEKCI REKTA

S o u h r n

Cílem naší práce bylo popsat charakteristiku křivky nitrobřišního tlaku u pacientů po elektivních resekcích rekta během prvních 48 hodin pooperačně. Dokázat hypotézu, že hodnota nitrobřišního tlaku ve sledovaném časovém intervalu narůstá a tím je objektivním korelátem pooperační paralýzy za níže uvedených podmínek. Zkoumat vztah maxima nitrobřišního tlaku k body mass indexu a přesně definované šíři anastomózy. Nitrobřišní tlak byl u každého pacienta měřen nepřímou metodou ve 4 hodinových intervalech. Ke statistickému zhodnocení bylo použito testu směrnice regresní přímky na hladině významnosti 5%. Statistickým srovnáním křivek závislosti nitrobřišního tlaku v čase u 24 pacientů jsme prokázali, že nitrobřišní tlak v prvních 48 pooperačních hodinách narůstá a je tak objektivním korelátem pooperační paralýzy střevní. Prokázali jsme, že maximální hodnoty nitrobřišního tlaku závisí na hodnotě body mass indexu a nezávisí na šíři anastomózy 21–33 mm. Výsledku bychom chtěli využít při hodnocení vlivu časné enterální výživy na pooperační paralýzu střev po elektivních resekcích rekta.

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