THE EFFECTS OF DIFFERENT TYPES OF ANASTOMOSES TECHNIQUES IN COLON MOTILITY IN DOGS

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ABSTRACT
Objective: To describe different motility resulted after various types of suture pattern of colon anastomoses in the dogs. Study design: Experimental study. Sample population: 12 dogs of crossbreed. Methods: Colon resection and anastomoses end-to-end were performed using four techniques: apposition monoplane in crushing suture; apposition monoplane in simple continuous suture; inverting monoplane in Cushing suture; biplane, with the muco-submucosal layer connected in simple interrupted suture pattern (first plane) and sero-muscular layer in simple continuous suture (second plane). The colon motility was registered with two electrical sensors-transducers for movements placed before and after each anastomose. Results: The comparative study of dog colon motility in end-to-end anastomoses reveals the appearance of regular basis of post-surgical intestine-peritoneal paresis with a duration that depends on the technique used for suture (1-12 hours). The best results are obtained using continuously monoplane suture techniques (simple continuous suture, Cushing suture). Conclusions: For recording the digestive motility, the technique using electrical transducers for movement, experienced in our country by Sărăndan et al. (1), proved to be reliable in the dog, too. Clinical relevance: The duration of paresis depends also on the suture technique used for anastomoses.

Keywords: dog, end-to-end anastomosis, motility

INTRODUCTION AND OBJECTIVE

The immediate post surgery intestinal-peritoneal paresis represents a complication appearing after any major surgery on abdominal cavity, its length ranging from several hours to three days. The intestinal distension installed consequent to paresis does represent the trigger for a chain of physiopathological

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phenomena with occlusive signs (2, 3, and 4). In the large number of references concerning digestive sutures there are no data regarding the influence of various suture methods in anastomoses upon intestinal motility. Based on these considerations we have conducted a comparative study on various suture techniques for end-to-end anastomoses of colon in dog.

MATERIAL AND METHOD

The comparative study of motility in the end-to-end anastomosed intestine was carried on four groups of dogs (one group = three individuals). Each animal was the subject of inhalator narcosis. Anesthesia lasted 27-30 minutes. Under anesthesia, in two dogs from each group was performed the end-to-end anastomoses of colon (at about 20cm distally to the ileo-cecal junction).

The anastomoses were sutured with PLA-910, material with thickness of 2mEP, using four suture techniques:

- apposition monoplane in crushing suture;
- apposition monoplane in simple continuous suture;
- inverting monoplane in Cushing suture;
- biplane, with the muco-submucosal layer connected in simple interrupted suture pattern (first plane) and sero-muscular layer in simple continuous suture (second plane).

The colon motility was registered with two electrical sensors-transducers for movements (ETM), after 30 minutes from animal detubation.

The electrical transducer for movements (ETM) converts the mechanical movement into an electrical size, the transducer consisting from a thin wire of manganine placed on a special paper stamp. The electrical transducers for movements were included in silicon using the technique described by Sârândan et al. (1) using two transducers fixed back to back for manufacturing a sensor. Information was converted using a Wheatstone bridge, connected to a Recorder registering unit.

At 3cm before and after each anastomosis were placed two sensors through suture at the colon serosa at 3cm before and after each anastomoses

The reference values are: segmentary contractions – ISB (isolated spike bursts) – with an average duration of five seconds and peristaltic movements – MSB (migration spike bursts) - lasting 3-5 minutes in repeatable cycles at 20 minutes intervals.

Fig. 1. The two electrical sensors-transducers placed through suture at the colon serosa at 3cm before and after each anastomoses

Fig. 2. The motility registration of unaffected colon in four witness dogs
The anastomoses motility was individually monitored for each type of suture till to the appearance of normally peristaltic waves, respective 2-3 MSB cycles in one hour.

RESULTS

The motility registration of unaffected colon in four dogs allowed the emphasizing of ISB lasting on average five seconds, being 20-30/hour. On the background of these contractions are superposed the strong peristaltic contractions (MSB) lasting 2-3 minutes and with a repeatability of 2-3 cycles per hour (fig. 1).

The mechanograms registered in the dogs with colon end-to-end anastomoses sutured in a single apposition plane in crushing suture reveals a intestinal-peritoneal paresis lasting for 220-240 minutes. First waves corresponding to an isolated electrical activity (ISB) have an irregular aspect and a diminished frequency. The peristaltic contractions are observed at 150 minutes after surgery (fig. 3).

The registration of motility in the end-to-end anastomosed colon, using simple continuous suture (fig. 4), reveals the shortest duration (of 30-45 minutes) for the immediate post-surgery intestinal-peritoneal paresis. Type ISB waves with irregular aspect and frequency are observed since 15 minutes post-surgery, followed at 20 minutes by peristaltic movements (MSB), which rapidly gain in tonicity and frequency (fig. 5).

In the inverting sutured anastomoses using Cushing monoplane suture, after 90-120 minutes the motility ranges between the controls limits. The segmentary movements appears in 45 minutes, but the interval till the constant presence of MSB waves is longer than in any other anastomoses techniques, being of 45-60 minutes (fig. 6). The mechanograms obtained on end-to-end anastomoses biplane sutured revealed the longest period for colon inactivity. The immediate intestinal-peritoneal paresis lasted for 8-12 hours. The ISB waves appeared at 320 minutes after surgery but were rare and extremely irregular as frequency and tonicity. The peristaltic movements started after 360-400 minutes but one cycle lasted 60-90 seconds and the repeatability degree follows the 45-50 minutes interval (fig. 7).

![Fig. 3. One mechanogram registered in the dog with colon end-to-end anastomoses sutured in a single apposition plane in crushing suture](image3.png)

![Fig. 4. Simple continuous suture: coil spatial disposition of the wire](image4.png)
Fig. 5. One mechanogram registered in the dog with colon end-to-end anastomoses sutured in simple continuous pattern

Fig. 6. One mechanogram registered in the dog with colon end-to-end anastomoses sutured in inverting continuous pattern (Cushing suture)

Fig. 7. The mechanogram obtained in biplane end-to-end anastomoses
DISCUSSIONS

The mechanograms obtained in this experiment do not differ to those described in the references (4) revealing the reliability of the method described in sheep by Sărândan et al. (1). The materials (ETM) and the techniques used in this experiment are allowing registering the motility in the dog’s intestine.

The latency for regaining motility of biplane-anastomosed colon is explained, by one hand, through the supplementary surgical trauma and by other hand, through the double quantity of suture material inserted in the stoma.

The supplementary surgical trauma is represented by the prolonged exposure, with 15-20 minutes comparative to the other suture methods, through prolonging with the same interval of local ischemia produced by the intestinal clamps and also through the double number of micro traumas caused by the implantation of suture material.

Our remarks are confirmed by the studies conducted on dogs, rabbits and horses (4, 6, and 7) emphasizing the neurogen origin of motility inhibition consequent to the action of traumatic factors (the surgery) and also to the locally septic-toxic factors, at witch action the peritoneal serosa reacts through paralytic reflex.

The mechanograms of biplane sutured anastomoses are supporting proves for the lack of usefulness of the second plane of suture (2, 3, and 8). The biplane-sutured anastomoses generates, compared to monoplane sutures, a prolongation of the immediate post-surgical paralitical ileus. Although the simple – immediate post-surgical paresis is a generally accepted state (5) being observed on regular basis after a major abdominal surgery, in our opinion, confirmed by many clinical remarks, its prolongation more than 4-6 hours could gain pathophysiological signification. The prolongation of paresis generates intestine distension, factor recognized as trigger for post-surgical complications with occlusive type manifestations (4). In the case of biplane sutures are growing the chances for evolution of pathologic states through the addition of factors as: luminal stenosis induced by multiplan sutures and edema of stoma sutured with catgut (9).

The anastomoses sutured in crushing separate points (8) generate a intestine – peritoneal paresis on the traumatic background of suture material crushing the serosa, musculosa and mucosa. Although a lot of authors (2, 6, and 8) are considering the anastomoses sutured in crushing separate points as the suture for the future, from the point of view of motility it appears as the suture mistakes due to the excessive tighten of wires, forming ischemia zones and consequent paresis.

After a similar physiopathological shape, but with a less extension, are behaving also the inverting anastomosis. The decreasing especially in temporal length of the paretical post-surgical phenomenon is expressing the low degree of local ischemia obtained through spatial shaping double helix of the surjet. The same phenomenon can be observed also in the anastomoses sutured in simple monoplane surjet. The reduced interval (45 minutes) for evolution of immediate post-surgical paresis supports the pertinence of this hypothesis.

From the point of view of post-surgical anastomoses, the end-to-end anastomoses are acting in a predictable manner, somehow similar to other parameters of healing.

The immediate post surgical intestine-peritoneal paresis after colon anastomoses evolves during one hour and 12 hours, depending on the used suture technique.

The best results, from the point of view of motility of anastomosed anes are obtained through techniques of monoplane continuous suture. Our remarks are emphasizing that monoplane sutures in simple continuous suture and inverting monoplane in Cushing suture are producing a short period intestine-peritoneal paresis, which is not able to induce post surgical complications with an obstructive evolution.

The contribution of digestive suture to post surgical paralitical ileus is represented by: excessive trauma generated by exposing, stitching micro traumas, crushing of intestine walls; local ischemia provoked by intestinal clamps, quantity of suture material; assure of stoma continuity.

CONCLUSIONS

The comparative study of dog colon motility in end-to-end anastomoses reveals the appearance on regular basis of post-surgical intestine-peritoneal paresis with a duration that depends on the technique used for suture (1-12 hours).

The best results are obtained using continuously monoplane suture techniques (simple continuous suture, Cushing suture).

The digestive suture contributes to trigger the immediate post-surgical intestine-peritoneal paresis through excessive trauma, local ischemia and the way of ensuring the continuity of anastomosed stoma.
The prolonging over 4-6 hours of the state of motile inactivity of anastomosed colon favoured intestine distension triggering occlusive complications. For recording the digestive motility, the technique using electrical transducers for movement, experienced in our country by Sărândan et al. (8), proved to be reliable in the dog, too.

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