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AIM: *Growth hormone is known to affect healing on the postoperative patient. The aim of the present experimental study was to evaluate the effect of systematic infusion of growth hormone on the healing of colonic anastomoses in rats.*
METHODS: *Fourty Albino-Wistar male rats were randomly divided into two groups, a control group (CONTROL) and a growth hormone (GH) group. In both groups, an end-to-end colonic anastomosis was performed after segmental resection. In the CONTROL group, 1 cc saline was administered subcutaneously in the experimental animals' necks in two equal doses daily until the sixth postoperative day. In the GH group, rats were administered a growth hormone solution (2 mg/kg b.w.) in an amount of 1 cc subcutaneously in their necks in two equal doses daily until the sixth postoperative day. Rats were sacrificed on the seventh postoperative day. Anastomoses were resected and macroscopically examined. Bursting pressures were calculated and histological features were graded and hydroxyproline was evaluated.*
RESULTS: *No deaths or wound infections were observed until the sacrifice. Bodyweight was significantly increased in the GH group until the seventh postoperative day ($p = 0.005$). Bursting pressures ($p = 0.0025$), adhesion formation ($p=0.0019$), hydroxyproline concentrations ($p = 0.007$) were significantly higher in the GH group than in the control group. Also GH lead to decreased inflammation ($p < 0.001$), but increased neoangiogenesis ($p < 0.001$), fibroblast activity ($p = 0.001$) and collagen deposition ($p < 0.001$).*
CONCLUSION: *Growth hormone, when applied systematically in rats with colonic anastomoses, promotes their healing in rats. Therefore, the application of growth hormone in colonic anastomoses leads to better outcomes.*

KEY WORDS: Adhesion, Bursting pressure, Collagen, Hydroxyproline, Inflammation, Neoangiogenesis

Introduction

Colonic anastomosis is a surgical technique used to restore colonic continuity after the resection of colon cancer. The healing of colonic anastomosis is considered a complex process that takes place directly after the anastomosis and its final result is the structural and operational restoration of bowel function.

The healing of colonic anastomosis is affected by several factors that can act either individually or in combination on collagen metabolism.
The first category includes local factors such as operative technique, blood flow on the anastomosis, preoperative colon preparation, peritonitis, preoperative chemoprevention and intestinal obstruction [1,2]. The second category includes general or systematic factors. In this category belong age, nutrition, diabetes, uremia, jaundice, cirrhosis, radiation, blood transfusion and drugs [3,4]. The complications that directly affect anastomosis are bleeding, stenosis and dehiscence[5-7]. Anastomotic dehiscence is one of the most important factors that determine the postoperative morbidity and mortality in large intestine surgery.

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Anastomotic dehiscence with or without anastomotic leak of intestinal content is the most common complication of colonic anastomosis and is responsible for 25-35% of all postoperative deaths. Anastomotic dehiscence is defined as complete or partial separation of the anastomotic line [8,9]. Anastomotic leak is defined as the excretion of intestinal content from the bowels, outside of the colon. Dehiscence usually occurs between the fifth and seventh postoperative day and more frequently after rectal anastomosis, where its incidence ranges from 3 to 21% [10]. The incidence of anastomotic rupture after colonic anastomosis is significantly less ranging from 0.2 to 4% [10,11]. This complication is not always followed by anastomotic leak, as adjacent organs and tissues can cover the deficit. In contrast, in the case of anastomotic leak, there is always anastomotic dehiscence. Several local and general factors are mentioned as the causes of anastomotic dehiscence, such as ischemia, anastomotic pressure, poor surgical technique, anemia and poor nutrition of the patient [11].

Growth hormone (GH) is an anabolic substance produced by the pituitary gland. The action of GH is twofold. It acts either directly or through other factors that are synthesized in the liver, which are called somatomedins. GH results in weight gain, activation, increase of basic metabolic rate and collagen deposition in tissues. That is probably how GH plays a beneficial role in healing. This growth factor is clinically used in patients with pituitary insufficiency, while it has been used experimentally for the improvement of healing in specific tissues [12].

GH affects the healing of colonic anastomosis. The metabolic response of the organism in a major peritoneal operation is characterized by weight loss and negative nitrogen balance, which can be further expanded by complications such as anastomotic dehiscence [13]. However, GH is considered a powerful anabolic factor that can offset postoperative weight loss, and because of its ability to increase in response to stress, it can be beneficial to patients during the recovery period [14]. The purpose of the current study was to evaluate the effect of GH on the healing of colonic anastomosis in rats [13,14].

The healing of colonic anastomosis was evaluated clinically with the measurement of the numbers of anastomotic ruptures and adhesions, mechanically with the anastomotic bursting pressure measurements, biochemically with the quantitative determination of tissue hydroxyproline in the anastomotic area and histologically with evaluation of microscopic healing with parameters [15,16].

Material and Methods

Laboratory Animals

Forty male Wistar rats weighing 200-300 g were used in this study. The research protocol was approved by the Ethical Committee of the Department of Veterinary Services of the Prefecture of Thessaloniki (S.N.: 13/10767/15-9-2003). The basic principles of laboratory animal care were followed, with proper care for minimizing the rats' pain and discomfort. Individual housing and unrestricted access to the standard laboratory diet and water pre- and postoperatively were accommodated. The rats were kept in our laboratory for seven to 10 days before the start of the experiment on a 12-hour light cycle and did not receive any course of preoperative antibiotics.

Experimental Groups, Anesthesia And Operative Technique

Rats were randomly assigned to two groups of 20 animals. In the control group (CONTROL), 1 cc saline was administered subcutaneously in the experimental animals' necks in two equal doses daily until the sixth postoperative day. In the GROWTH HORMONE (GH) group, rats were administered a growth hormone solution (2 mg/kg b.w.) in an amount of 1 cc subcutaneously in their necks in two equal doses daily until the sixth postoperative day. For the administration of test substances, the rats were subjected to light sedation with ether. They were placed in a room with ether for a few seconds in order to achieve satisfactory anesthetization for the administration of the substances by injection, and then they were repositioned in their cages. The initial and final weights of the rats were measured, and any changes were recorded. The surgery was performed under general anesthesia. First, the animals were placed in a room with ether for a few seconds, and then thiopental solution was administered intraperitoneally at a dose of 50 mg/kg of bodyweight. The anesthesia lasted 50 to 60 minutes. After the induction of anesthesia, the hairy part of the abdomen was shaved, followed by antisepsis with the use of 10% povidone iodine solution (Betadine). Then, the test animal was placed on a disinfected surgical table, its limbs were immobilized, and a sterile surgical field was placed in the abdominal wall. Operations were performed through a 3 cm midline incision. The colon was recognized and placed outside of the peritoneal cavity. Then, with the guidance of the ileocecal valve, at a distance of 10 cm from it, part of the transverse colon, 1 cm long, was excised. Afterwards, an end-to-end colonic anastomosis was created using a single layer of eight interrupted extramucosal 6-0 polypropylene sutures. Then, the peritoneal cavity was washed with saline (NaCl 0.9%), and the abdominal wall was closed with three or four silk sutures 3/0. No antibiotics were administered to animals, and the net surgical time ranged from 15 to 25 minutes.

Macroscopic Examination

The planned sacrifice of the animals took place on the seventh postoperative day. All animals were anesthetized and then euthanized by intracardiac administration of

KCL 10% for tissue collection. The anastomoses were examined macroscopically for the following parameters: integrity of the anastomosis, existence of abscess or peritonitis and adhesion formation. The evaluation was performed according to the scale of van der Hamm *et al.* [17] Briefly, anastomosis was given a score from 0 to 3: (0) no adhesions; (1) minimal adhesions, mainly between the anastomosis and the omentum; (2) moderate adhesions, *i.e.*, between the omentum and the anastomotic site; and (3) severe and extensive adhesions, including abscess formation.

Bursting Pressure

Bursting pressure was measured *ex vivo*. The anastomosis was removed along with a 5 cm segment of the colon in total *en bloc* with the formed adhesions. The proximal end was ligated, and a catheter was secured into the distal end and fixed to the bursting pressure apparatus. Through this catheter, the bowel was infused with a continuous flow of physiological saline at a rate of 1 mL/min. The bursting pressure was defined as the pressure at which leakage of saline or gross rupture was noted and was recorded in mmHg. The site of leakage during the bursting pressure measurement was also recorded, since rupture occurred at the anastomotic site or far from it.

Histological Assessment

After the *ex vivo* measurement of bursting pressure, the anastomotic segment of the colon was placed in 4% formaldehyde solution for histopathological examination. The histological sections were 3 μm thick and stained with hematoxylin and eosin. The anastomosis was examined microscopically and graded histologically in a blind fashion, using a 0-4 Ehrlich and Hunt numerical scale as modified by Phillips et al.[18]
The evaluated parameters were inflammatory cell infiltration (white blood cell count), neoangiogenesis (new blood vessel formation), fibroblast activity and collagen deposition. Each studied parameter was evaluated individually using a numerical scale from 0 to 4 as follows: (0) no evidence, (1) occasional evidence, (2) light scattering, (3) abundant evidence and (4) confluent fibers or cells.

Hydroxyproline

Quantification of collagen in colonic anastomosis is synonymous with quantification of hydroxyproline. For the identification of hydroxyproline on the area of anastomosis, the segment of the anastomosis that was stored at –20°C was used. This part of the tissue was weighed on a high-accuracy weight scale. This sample was then placed in 30 μL of concentrated solution of sodium hydroxide (NaOH) of 10.125 N. The solution was made by dissolving 0.86 g of NaOH in 2 mL of distilled water. The purpose of this mixing was the extraction of the collagen from the tissue and conversion to solution form. The resulting solution was then incubated for 20 min at 120°C by autoclaving. Then, 35.5 μL of concentrated hydrochloric acid (HCl) with concentration of 8 N was added to the resulting solution. This solution was prepared by the addition of distilled water to a solution of 1.578 μL of 37% hydrochloric acid, up to a total solution to a volume of 2 mL. This procedure was applied to address the binding of NaCl to the tissue, the measurement of which can lead to wrong conclusions. 450 μL of freshly prepared alcoholic solution of T-chloramine, concentration 0.056 M. The solution of T- chloramine was obtained by dissolving 0.635 g of chloramine in 10 mL propranolol 50%, which was then diluted until it reached a volume of 50 mL with the addition of acetyl citric acid buffer. This complicated procedure was applied to dissolve the collagen of the tissue and to homogenize the solution. Finally, 500 μL of 1 M Ehrlich reagent were added, and the solution was incubated for 20 min at 65°C. After this procedure, the solution was placed on a spectrophotometer, and the absorption was calculated at 550 nm. With the help of an absorption curve and a mathematical formula, a calculation of hydroxyproline was performed [15].

Statistical Analysis

The extracted data were summarized using statistical descriptive indices of central tendency and dispersion. Data appear as mean value +/- standard deviation or median and range, whenever more appropriate. The data were evaluated depending on presentation of normal distribution or not, using a normality test. Continuous values were expressed in means and standard deviations when normally distributed while in medians and interquartile ranges when not normally distributed. For the values following normal distributions, t-tests was used and for values that did not follow a normal distribution, the Mann-Whitney test was used. Categorical variables were expressed with frequencies and percentages. Percentages were compared using the Fisher's Exact Test. The level of statistical significance was set at p value <0.05 for the comparisons between the groups. All the statistical analyses were performed using the IBM SPSS Statistics (V.22).

Results

Bodyweight Change

Bodyweight was measured in all rats before the experiment. Bodyweight was measured with precision scales

following anesthetization of the experimental animal. The same measurement was repeated on the day of sacrifice. In the control group, the mean bodyweight of the rats decreased during the experiment and until sacrifice. This change was statistically significant (p = 0.005). In the GH group, an increase in the mean bodyweight of the rats was observed during the experiment. This change was statistically significant (p = 0.042 The increase in bodyweight in the GH group was significantly different than the decrease in the control group (p=0.008). The mean bodyweights and mean bodyweight changes are presented in a graph format in Fig. 1.

Anastomotic Dehiscence

No deaths or wound infections occurred before the day of sacrifice. All animals were sacrificed, and an autopsy took place on the seventh postoperative day. During the autopsy, a macroscopic control took place to check if there was any anastomotic dehiscence. The macroscopic control showed no anastomotic dehiscence in either of the two groups.

Bursting Pressure Measurement

The GH group showed statistically significantly higher values of bursting pressure compared to the control group (p = 0.0025). In several experimental animals, a rupture of the part of the intestine away from the anastomosis was observed in the process of testing bursting pressure. In the GH group, in 80% of the cases, the rupture was observed away from the anastomosis site, compared with 60% in the control group. The locations of the ruptures in the two groups when testing the anastomotic bursting pressure are described in Fig. 2. The rupture in the area of anastomosis was more common in the control group than in the GH group, but there was no statistically significant difference (p = 0.296).

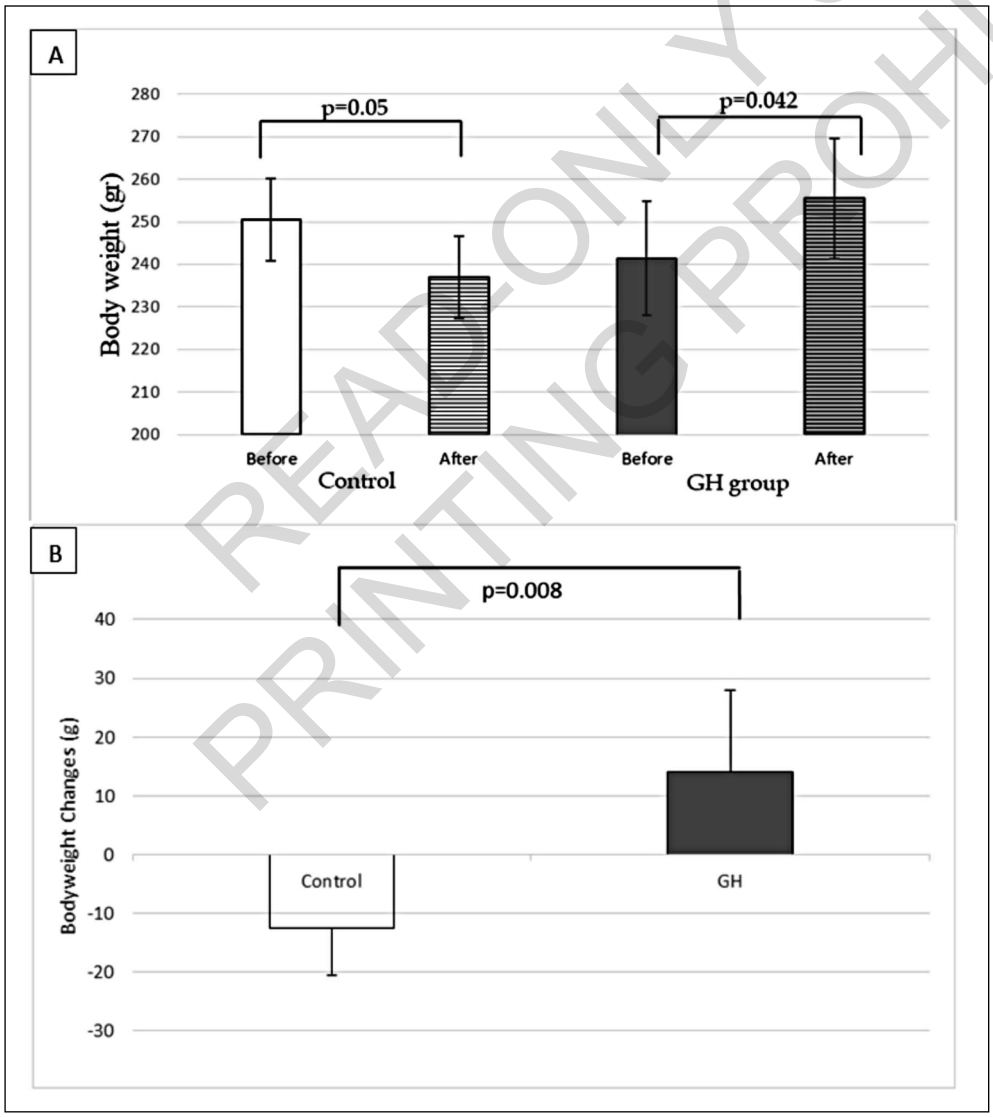

Fig. 1: Body weight: **A**) Comparative bar chart of body Weight (gr). In Control group, there was a statistically significant decrease in body weight changes. In GH group, there was a statistically significant increase in body weight changes. **B**) Comparative bar chart of Body weight changes. The increase in bodyweight in the GH group was significantly different than the decrease in the control group.

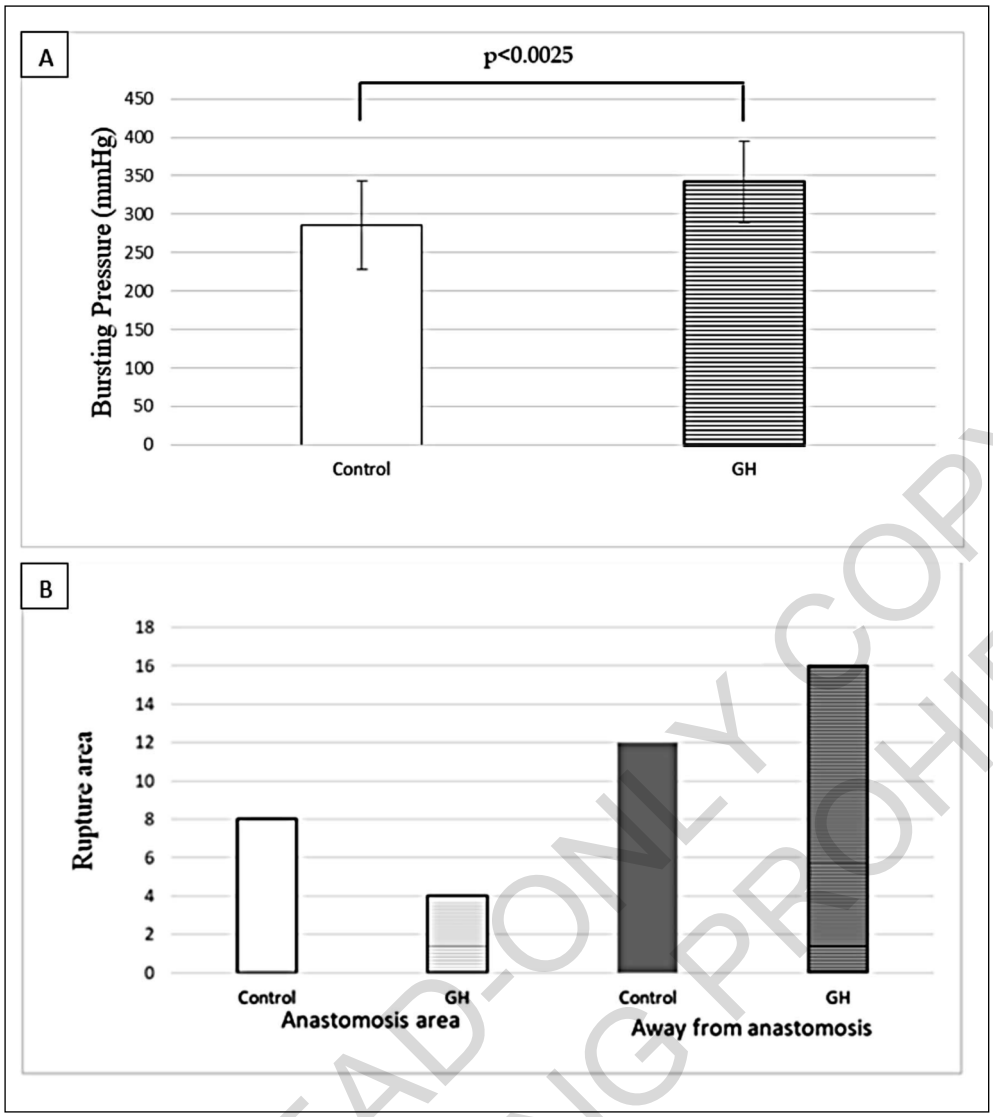

Fig. 2: Bursting pressure. **A**) Comparative bar chart of bursting pressure (mmHg). The GH group showed statistically significantly higher values of bursting pressure compared to the control group. **B**) Comparative bar chart of rupture area during bursting pressure. The rupture in the area of anastomosis was more common in the control group than in the GH group, but it was not statistically significant.

Adhesion Formation

There was a statistically significant difference in adhesion formation in between the groups. In the control group, 30%, and in the GH group, 10% of the rats did not show any adhesions postoperatively. In addition, in neither groups, did any rats showed adhesions postoperatively that was graded with score 3 according to Van der Hamm's scale. The incidence of varying degrees of adhesions is shown in Fig. 3. The control group showed statistically significantly fewer adhesions than the GH group ($p = 0.0019$).

Hydroxyproline

A section of the anastomotic area was sent for measurement of hydroxyproline as an indirect quantification of the amount of collagen in the area of anastomosis. The GH group showed a significantly higher mean of hydroxyproline than did the control group ($p = 0.007$). Fig. 4 summarizes the values of hydroxyproline in the two groups.

Histological Assessment

The histological assessment of the anastomotic healing included measurements of inflammatory cell infiltration, neoangiogenesis, fibroblast activity and collagen deposition. Statistical analysis revealed significant changes in all histological parameters: inflammation ($p < 0.001$), neoangiogenesis ($p < 0.001$), fibroblast activity ($p = 0.001$) and collagen deposition ($p < 0.001$).

The average inflammatory cell infiltration was significantly lower in the GH group than in the control group ($p < 0.001$). Regarding neoangiogenesis, there was an increase in the GH group compared to the control group

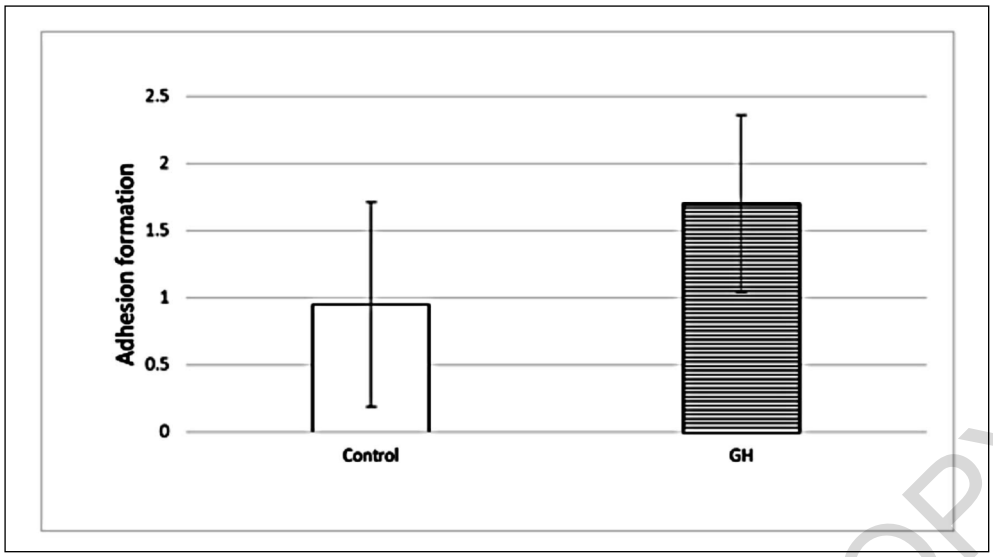

Fig. 3: Comparative bar chart of adhesion formation. The control group showed statistically significantly fewer adhesions than the GH group.

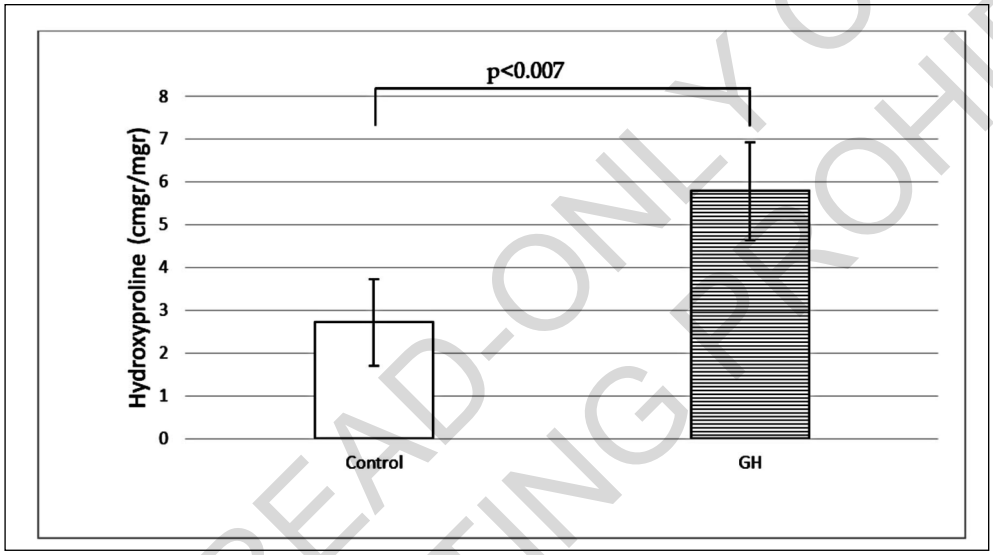

Fig. 4: Comparative bar chart of hydroxyproline (cmgr/mgr) tissues. the GH group showed a significantly higher mean of hydroxyproline than did the control group.

($p < 0.001$). Collagen deposition was statistically significantly lower in the control group than in the GH group ($p = 0.012$). Finally, there was a statistically significant increase in the fibroblast activity in the GH group compared with the control group ($p < 0.001$) (Fig. 5) summarizes inflammatory cell infiltration, neoangiogenesis, collagen deposition and fibroblast activity respectively.

Discussion

The healing of colonic anastomoses presents the same phases as any other trauma and is dependent on local and systemic factors whose purpose is synthesis and deposition of collagen in anastomosis. The healing mechanisms are divided into three different phases[19-21]. The first one is the inflammation phase, which starts immediately after the injury and includes the activation of the clotting mechanism and specific elements of the complement that attracts immune cells, such as macrophages, fibroblasts and endothelial cells. T-lymphocytes are also activated through macrophage activation [22]. Epithelial cells are proliferated and migrate to the injured area to cover the gap. The productive phase manifests with the formation of granular tissue, collagen deposition and angiogenesis. This phase begins after the third day of healing and is completed on the fourteenth day [23,24]. The third phase is the anaplastic or wound remodeling phase [25]. During this phase, cell maturation and remodeling of extraluminal content take place, and it can last up to one year. The main characteristics are the collagen deposition and tissue remodeling that leads to the formation of connective scar tissue.

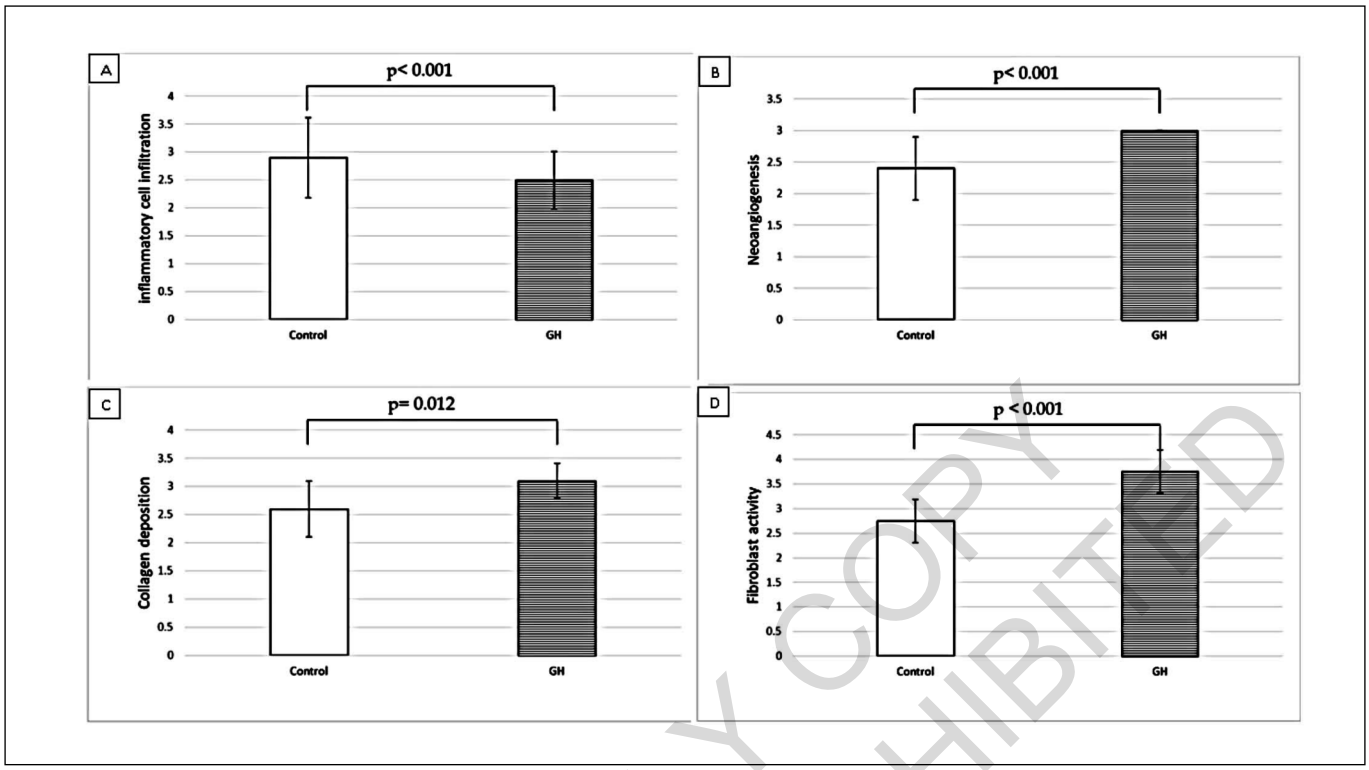

Fig. 5: Histological assessment: (A 0-4 Ehrlich and Hunt numerical scale was used for histological grading.) **A**) Comparative bar chart of inflammatory cell infiltration. There was a statistically significant difference between the two groups. **B**) Comparative bar chart of neoangiogenesis. There was a statistically significant difference between the two groups. **C**) Comparative bar chart of collagen deposition. There was a statistically significant difference between the two groups. **D**) Comparative bar chart of fibroblast activity. There was a statistically significant difference between the two groups.

The inadequacy of the healing process results in disruption or leakage from an anastomosis, thus increasing significantly postoperative morbidity and mortality. To avoid this complication and to achieve strengthening of an anastomosis, the application of various local and/or systemic factors has been proposed in order to eliminate this negative effect of increasing the risk of leakage [8,26-29].

Colorectal cancer is the third most frequent malignancy worldwide, and surgical resection remains until today the only effective treatment. The preservation of the anatomical continuity of the colon following surgical resection and anastomosis, in addition to satisfactory anastomotic healing, is a necessary condition to ensure a good quality of life for patients [30].

GH is the most powerful known anabolic substance. Its administration causes an increase in the biosynthesis rate of proteins, and at the same time is involved in the metabolism of fat and carbohydrates. This action is mainly due to an increase in the production of mRNA and has a direct effect on ribosome function by increasing their number. In addition, GH causes an increased amino acid input rate inside the cells. All these actions result in positive nitrogen balance and the decrease of urea and blood amino acid levels. Due to the parallel retention of other inorganic elements from the growth tissues, other specific effects of GH are observed, such as positive calcium or phosphorus balance and decrease of potassium and sodium excretion. In order to fully develop GH's action in protein biosynthesis, the presence of insulin and thyroid hormones is essential [31].

GH is a trophic factor of the gastrointestinal tract, and GH receptors have recently been observed in the large intestines of rats [32,33] Christensen et al., in an experimental anastomosis study of the colon in rats, observed that exogenous GH administration resulted in an increase in mean bodyweight compared to the control group, which showed a decrease [34]. Similar results presented by Ward et al. who examined the effect of GH on healing anastomoses of rats' colons, finding that treatment with GH significantly increased rats' bodyweights [35]. This observation was also confirmed by Hammarquist et al., who also reported a significant increase in the average bodyweight in their rats after treatment with GH [36]. In our study, a significant increase in the mean bodyweight was found in rats in the GH group during the experiment compared to the control group. In the GH group,

the catabolic action of the intervention appeared to be completely reversed by the anabolic action of the agent, resulting in weight gain [34,37].

The clinical confirmation of the healing failure of the anastomoses is expressed with the frequency of dehiscence. In our study, no clinical dehiscence from anastomosis was recorded in the GH group, confirming the successful healing process in these animals. This significant complication has led to the development of scientific methods to evaluate the integrity of anastomoses. One of the methods of evaluating the healing of colonic anastomoses includes the measurement of the bursting pressure [38]. It evaluates the mechanical anastomotic strength by measuring the resistance of the gut wall to intraluminal pressure comparable to the physiological pressures of intestinal function [39]. In a previous experimental study in rats, GH administration resulted in a significant increase in bursting pressure of anastomoses on the fourth postoperative day, 59% higher than the control group when GH administration was initiated seven days preoperatively and continued until the fourth postoperative day and 34% higher than in the control group when GH administration was initiated perioperatively [40]. In the current study, GH appeared to have a positive effect, as its administration to the GH group resulted in a statistically significant increase in the bursting pressure of the anastomoses compared to control group. It should be noted that the rupture in the bursting pressure test in the GH group of experimental animals occurred away from the area of anastomosis in 80% of cases, suggesting the mechanical integrity of anastomoses [41].

Adhesion formation in the peritoneal cavity is a result of the normal recovery vasculature in ischemic regions [26,42,43]. Initiation of the inflammatory reaction results in fibroblast activation and collagen deposition and is related to the creation of adhesions, the retention of which depends on the activation and adequacy of the fibrinolytic mechanism. The anabolic action of GH is expected to result in activation of the synthetic mechanism of reaction that develops after an injury of the serosa. Adhesions usually have a positive effect on the healing process because they entangle small ruptures of colonic anastomoses while improving their perfusion by providing neoplastic arterial adhesions and lower their degradation. In this experimental study, adhesion formation in the GH group was statistically significantly greater than that of the control group.

The production and deposition of collagen in an anastomosis is one of the most important indicators of the adequacy of the healing mechanisms. Thus, a method of evaluation of anastomotic healing is measuring the hydroxyproline levels in tissues. Hydroxyproline is one of the four main amino acids of collagen and is mainly found in connective tissue collagen. By measuring hydroxyproline, the total amount of collagen in specific tissues can be evaluated, thus measuring the efficacy of the healing process of colonic anastomoses [44,45]. The amino acid hydroxyproline is characteristic of the alpha chains of the collagen molecules, and it is formed from the hydroxylation of proline before the alpha chains are pooled, forming a triple helix. The measurement of hydroxyproline refers to the quantitative determining of total collagen synthesis, an element necessary for the healing process [15]. In this study, the measurement of hydroxyproline was significantly increased in the GH group relative to control group. These findings are similar to those presented by Christensen et al., who recorded a 92% increase in anastomosis-derived collagen after GH administration relative to the control group [34]. Another study also reported increased collagen deposition in the GH group by 40% relative to the control group [40].

GH also causes collagen synthesis in vitro by stimulating fibroblasts, the main producers of collagen [47]. The effect of GH is related to the production of IGF-I in the liver, along with the presence of gastrointestinal IGF-I receptors and GH receptors in rats' intestines [33,40,46-51]. GH is also reported to have an effect on the intestinal epithelium, in muscle fibers and fibroblasts, preventing intestinal mucosal atrophy in rats[32-34]. Therefore, GH limits the harmful effects of bacteria as well as bacterial damage from toxic metabolites, thus reducing the inflammatory response and promoting the healing process [46,48,49,5]. In this study, the inflammatory cell infiltration during histological examination of anastomoses was limited in the GH group relative to control group, a change that was statistically significant.

Neoangiogenesis was also increased in the GH group relative to control group. Finally, in this study, corresponding to the increased levels of hydroxyproline were the increases in both neo-collagen and fibroblasts in the histological examination of rats that had received GH.

The metabolic response of the organism to a major intra-abdominal intervention is characterized by weight loss and a negative nitrogen balance, which is compounded by complications such as leakage from an anastomosis [53,54]. However, GH is considered to be a potent anabolic agent, a factor that can compensate for postoperative weight loss, and because of the ability to increase its production in response to stress, it can be beneficial for patients who are in the recovery period [55].

Various studies indicate that the administration of GH preoperatively may reduce the risk of anastomotic dehiscence, as evidenced by the increased bursting pressure of the anastomoses and the increased intestinal wall tension observed, suggesting that the administration of GH can have a significant effect on healing of anastomoses during the early phase of the healing process of the intestine [13]. During the first postoperative days, the risk of anastomotic dehiscence is greater, and studies have shown that the bursting pressure of anastomoses is greater after administration of GH. In particular, more than 92% of the anastomoses in the GH group ruptured elsewhere in

the gut, while in the control group, this percentage was 50% [13]. This difference of the type of rupture can suggest that the beneficial effect of GH is more related to the anastomotic line than to a generalized increase in intestinal wall strength or the effect of collagenase activity [13]. This is confirmed by Christensen et al., who found that the administration of GH appears to have a stimulatory effect on the intestinal walls of animals after administration of GH for one month [37]. The stimulant effect of GH on injured tissues has been also observed in skin injuries and in fractures [56-58]. Experimental studies on lab rats have indicated that postoperative GH administration has resulted in mechanical reinforcement of colonic anastomoses, increasing the collagen deposition rate on them [37,38,44].

In conclusion, the effect of GH on colonic anastomoses in rats results in the increase of both qualitative and quantitative collagen, as expressed by the measurement of hydroxyproline, which strengthens the anastomoses. The result is an increase in the mechanical strength of anastomoses, as expressed by the increased values of bursting pressure.

Riassunto

OBIETTIVO: è noto che l'ormone della crescita influisce sulla guarigione del paziente postoperatorio. Lo scopo del presente studio sperimentale era di valutare l'effetto dell'infusione sistematica dell'ormone della crescita sulla guarigione delle anastomosi del colon nei ratti.

METODI: Quaranta ratti maschi Albino-Wistar sono stati divisi casualmente in due gruppi, un gruppo di controllo (CONTROL) e un gruppo di ormone della crescita (GH). In entrambi i gruppi è stata eseguita un'anastomosi del colon end-to-end dopo resezione segmentale. Nel gruppo CONTROL, 1 cc di soluzione salina è stato somministrato per via sottocutanea nel collo degli animali da esperimento in due dosi uguali al giorno fino al sesto giorno postoperatorio. Nel gruppo GROWTH HORMONE (GH), ai ratti è stata somministrata una soluzione GH (2 mg / kg di peso corporeo) in una quantità di 1 cc sottocutanea nel collo in due dosi uguali al giorno fino al sesto giorno postoperatorio. I ratti sono stati sacrificati il settimo giorno postoperatorio. Le anastomosi sono state resecate ed esaminate macroscopicamente. Sono state calcolate le pressioni di scoppio, sono state classificate le caratteristiche istologiche ed è stata valutata l'idrossiprolina.

RISULTATI: Nessuna morte o infezione della ferita è stata osservata fino al sacrificio. Il peso corporeo è risultato aumentato significativamente nel gruppo GH fino al settimo giorno postoperatorio (p = 0,005). Le pressioni di scoppio (p = 0,0025), la formazione di aderenza (p = 0,0019), le concentrazioni di idrossiprolina (p = 0,007) sono risultate significativamente più elevate nel gruppo GH rispetto al gruppo di controllo. Il GH porta anche ad una riduzione dell'infiammazione (p <0,001), ma a un aumento della neoangiogenesi (p <0,001), dell'attività dei fibroblasti (p = 0,001) e alla deposizione di collagene (p <0,001).

CONCLUSIONE: L'ormone della crescita, quando applicato su anastomosi del colon, promuove la loro guarigione nei ratti. Pertanto, l'applicazione dell'ormone della crescita nelle anastomosi del colon porta a risultati migliori.

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