قسم : الجراحة
كلية الطب البيطرى - جامعة أسيوط
رئيس القسم : ا.د / نبيل أحمد مسك

الأستئصال التجريبى الجزئى للرغام وتوصيله فى الكلاب

نبيل مسك ، فتحى مكادى ، أبراهيم حسين

أجريت هذه الدراسات التجريبية فى جراحة الرغام العنقى على عدد ٥٤ من الكلاب السليمة فى الناحية الصحية وقسمت الى مجموعتين :

المجموعة الأولى : وتضم عدد ٣٦ حيوان قسمت الى ٦ مجموعات تم أزالة عدد ٥ حلقات فى المجموعة الأولى وعدد ١٠ حلقات فى الثانية وعدد ١٥ فى المجموعة الثالثة وعدد ١٨ - ١٩ حلقة فى المجموعة الرابعة مع أستعمال خيط الحرير رقم ٣ / صفر فى هذه المجموعات بينما تم أستئصال عدد ٥ حلقات فى المجموعة الخامسة و١٠ حلقات فى المجموعة السادسة مع أستعمال خيط أمعاء القط ٣ / صفر .

المجموعة الثانية : وتضم عدد ١٨ حيوان قسمت الى ثلاثة مجموعات حيث تم أستخدام ثلاثة طرق لتوصيل الرغام بعد أستئصال خمسة حلقات .

وقد أظهرت نتائج هذا البحث ما يلى :

١ - الحد الأقصى لأستئصال الحلقات العنقية فى الكلاب ١٨ أو ١٩ حلقة بدون مضاعفات أكلينيكية ملحوظة مع أستعمال خيط الحرير .

٢ - الخياطة بطريقة الغرز المتبتة Stay فى حالات الأستئصال الصغيرة فى الرغام بالأضافة الى مجموعة الغرز المتقطعة فى حالات الأستئصال الكبيرة تعتبر أفضل الطرق لتوصيل الرغام .

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EXPERIMENTAL TRACHEAL RESECTION AND ANASTOMOSIS IN DOGS

(With 17 Figures)

By
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SUMMARY

Tracheal resection with end-to-end anastomosis was accepted as an ideal method for correction of many congenital and acquired surgical affections of the trachea. Clinical attempts for tracheal grafting had been plagued by infection, ingrowth of fibrous tissue, migration of the graft and evintial stenosis (GREENBERG, 1960 and HARRINGTON et al., 1962).

End-to-end tracheal anastomosis after small or massive tracheal ring resection was indicated for congenital localized tracheal stenosis, diverticulum, collapse, perforation, rupture, fracture, fistulae, tracheomegally and primary or secondary neoplasms (SCHEBITZ, 1960, SHAFF, 1963, PERELMAN, 1972, GRILLO, 1973, SCOTT, 1978, BEAUMONT, 1982 and BEDFORD, 1982).

The amount of cervical tracheal ring resection stated in the available literature in dogs ranged from 4-23 ring (FERGUSON, et al., 1950 and DLLMAN and BOJRAB, 1981).

Many suture patterns were indicated for end-to-end anastomosis (DEDO, et al., 1969, ORDON, 1973, KOTAKE and GRILLO, 1976 and LAU, et al., 1980).

The aim of the present study is to determine the possible amount of tracheal ring resection as well as to select the most suitable pattern for trcheal anastomosis in dogs.

MATERIAL and METHODS

The present work was carried out on 54 clinically healthy stray dogs (1-5 years old & 8-20 Kg. body weight). The experimental animals were divided into two main groups:

Group I (36 animals) :

In this group animals were divided into 6 subgroups. The first four subgroups were subjected to ascending tracheal ring resection; 5, 10, 15 and 18 - 19 rings. Silk No. 3/0 with rounded needle and stay stitches with interannular interrupted suture pattern were used. The last two subgroups were subjected to 5 & 10 tracheal rings resection using the same suture pattern with chromic catgut 3/0.

Group II (18 animals) :

Animals were divided into 3 subgroups. Five rings were resected and silk No. 3/0 with rounded needle was used in all subgroups. Three different suture patterns were tested namely; stay, interrupted interannular and both together.

Animals before operations were premedicated with intramuscular injection of chloropromazine Hcl. (Neurazine) in a doze of 1 mg/kg. b.w. General anaesthesia was then conducted by I/V injection of thiopental sod. (Nesdonal) 5% until reflexes subside. The ventral aspect of the whole neck was prepared for aseptic operation. A longitudinal incision 8-12 cm length was performed at the midline of the ventral aspect of the neck. the two sternohyoidius muscles were bluntly seperated and drawn aside to expose the trachea. The later was elevated by a blunt dissecting scissors and haemorrhage was controlled either by pressure or ligation. Stay stitches were applied before resection. The threaded needle passed around the proximal tracheal ring to the resected segment and passed to the second tracheal ring caudal to it. The four stitches were applied with 90° intervals and lefted in their places until resection has been performed. Tracheostomy was carried out along the cranial and caudal edges of the resected part. After resection the four stitches were knoted.

In cases of application of inerrupted interannular stitches alone, two holding stiches were placed at the proximal stump and another two at the distal one until the interrupted stitches were applied.

When both patterns were used, stay stitches were carried out first then resection was performed was performed and after that the interrupted interannular stitches wre applied (Fig. 1).

The two sternohyoidius muscles were coaptated by simple interrupted stitches and the skin was apposed by interrupted horizontal mattress silk suture.

Animals were clinically observed from the day of operation till the time of sacrification.

Post mortem examination was directed to determine the followings :

1- Adhesions between the trachea and the surrounding structures.
2- The condition of the tracheal anastomosis from outside for the presence of rupture, haematomas and fistulae.
3- Presence of suture material.

The seat of anastomosis was resected out and opened longitudinally at the dorsal membranous part and examined for:

1- Formation of membranous ride and the degree of tracheal stenosis.
2- Healing condition of the tracheal wound with special reference, to the mucous membrane.
3- Presence of suture material.

RESULTS

1 : Number of possible tracheal rings resection :

The possible number of tracheal ring resection reached up to 19 cervical tracheal rings with the use of nonabsorbable suture material. Additional resection was impossible because the number of the cervical tracheal rings ranged between 20-24. Resection with the use of chromic catgut not exceed more than 10 tracheal rings otherwise rupture will resulte.

All animals of this group servived the operations wihout obvious clinical complications.

Clinical observations :

Animals have a normal appetite at the third day after operation. The swallowin process was somewhat difficult at the first few days. They shoed neither cough nor strider postoperatively. barking was disturbed at the first few days and gradually return to normal at the end of the first week. Complete extension of the neck was observed in all animals except at the fourth subgroup which has a limited degree of nech extension to the end of the first week (Fig. 2).

Post mortem examination :

Adhesions between the operated part of the trachea and the surroundin structures were not observed at the first three subgroups while slight to moderate adhesions were observed at the fourth subgroup (Fig. 3).

The suture material in most cses appeares imbeded inside the tissues (Fig. 4). In some other cases the annular and stay sitches were clear (Fig. 5). From inside the interannular suture materials were burried inside tissues and covered by a mucous membrane (Fig. 6). In small resections the stay stitches appeared clear 6Fig. 6). While in massive resection the suture materials were either imbeded inside tissues (Fig. 7) or started to migrate towards the tracheal lumen in a form of a loop or sinle hanging thread (Fig. 8). At the end of the third month the stay stitches were absent (Fig. 9).

The tracheal wall at the seat of anastomosis appeared thicker than the original.

One and in cross section the thickness was evident at the ventral and lateral walls (Fig. 10).

Stenosis at the suture line due to formation of a membranous ridge gradually increased in width as the amount of segmental tracheal resection increased. The width of the ridge at the subgroup one ws less than 1 mm (Fig. 11). At the subgroup two and three the formed ridge reached 4-5 mm in width. A large membranous ridge was formed at he subgroup four reducing the lumen of the trchea to about 50% of its original one (Fig. 12). The width the membrane was larger at the dorsal and lateral aspects (Fig. 13).

In cases of tracheal resection and anastomosis using catgut, circumferential depresion all around the area of suturing ws formed (Fig. 14). A considerable ridge occupying about 50-75% of the tracheal lumen was also evident (Fig. 15).

II- Different suture patterns for tracheal end-to-end anastomosis :

The clinical picture in this group was the same as in the first group.

Post mortem examination :

Subgroup I: No adhesions were observed and complete healing all around the line of anastomosis was detected. The tracheal wall at the seat of anastomosis appeared thicker than the original one. The mucous membrane covered completely the area of anastomosis one month postoperatively. The stenotic ridge was smaller in width (1-2 mm) (Fig. 16).

Subgroup 2: Slight adhesions with the surrounding structures were observed. Circumferential depression was formed at the line of anastomosis without any leakage (Fig. 17). The

tracheal wall was thinner than the original one and consisted only of interannular ligament. A large stenotic membranous ridge about 0.6 cm. in width was formed.

Subgroup 3: Slight adhesions were observed between the operated part of the trachea and the sternohyoid muscles. A good healing at the line of anastomosis was obtained without any leakage. The tracheal wall appeared more thicker than normal wth formation of a small stenotic membranous ridge.

DISCUSSION

The trachea is an organ that can tolerate extensive surgical manipulation. If a few basic principles are followed, resection and end-to-end anastomosis will be a practical procedure for the correction of various forms of tracheal affections.

As the maximum number of cervical tracheal rings wass 24 in dogs, the possible resection could not exceed more than 20 rings. In our study 19 tracheal rings were resected without any significant postoperative complications. the left 4-5 rings were used for fixation of the suture material during tracheal anastomsis. The only possible complication stted by CANTRELL and FOLSE (1961) that the animal may limit the extension of its neck for several days, have been also observed in our experimental animals. FERGUSON, et al. (1950) stated that relief of tension at the line of anastomosis depends upon the elasticity of the trachea, the mobility of the larynx and carina and the position of the head and neck. In our experiment the elasticity of the trachea in dogs was sufficient for massive resections. The length of the trachea with hand stretching increased by 5 cm. more than the normal length. Radiological examination of cases with 15 and 19 tracheal ring resections also revealed that the larynx and carina moved a little bit backward and forward toward the line of anastomosis, an observation which is supported by MASIEL and DINGWALL (1950). At the same time, position of the head and neck during massive resection facillitated the approximation of the tracheal stumps during anastomosis (FERGUSON, et al. 1950, PAULSON, 1951 and CANTRELL, et al. 1961).

From our point of view circumferential division of the annular ligament sugested by SOM and KLEIN (1958) to relief excessive tension at the line of anastomosis can not be recommended. The incision of the annular ligaments within the intercartilaginous space may allow for some elongation of the trachea although this will not increase the length of the membranous portion of the wall. In cases of massive tracheal resection the use of non-absorbable suture material was obligatory inspite of presence of many criteria against it. Such suture material does not losse their tensile strength for a long time and assist the coaptation of the anastomotic stumps together for sufficient time for healing process. The use of catgut in cases of small tracheal resections gave satisfactory results while in massive resections a grave risk could be expected. Chromic catgut losses its tensile strength at 4th or 5th day after anasomosis (RITTER, 1945).

The end-to-end anstomosis using stay stitches fullfill the requirments essential for successful tracheal anastomosis stated by DEDO, et al. (1969). Such suture technique leads to close apposition of the tracheal stumps and prevent any significant tension on the line of anastomosis. Moreover, tissue reaction to the suture material at the line of anastomosis was minimum.

Application of simple interrupted interannular stitches in addition to the stay sutures was importent in massive resections. the stay stitches reduce the tension at the line of anstomosis and the interannular stitches prevent any leakage at the seat of anastomosis.

In cases of application of simple interrupted interannular stitches alone the results of the healing process even in small resections were not encouraging. A wide circumferential depression at the seat of anastomosis was observed and a large stenotic circular ridge was formed. The presence of membranous partial obstruction may threaten the life of the animal and lead to suffocation.

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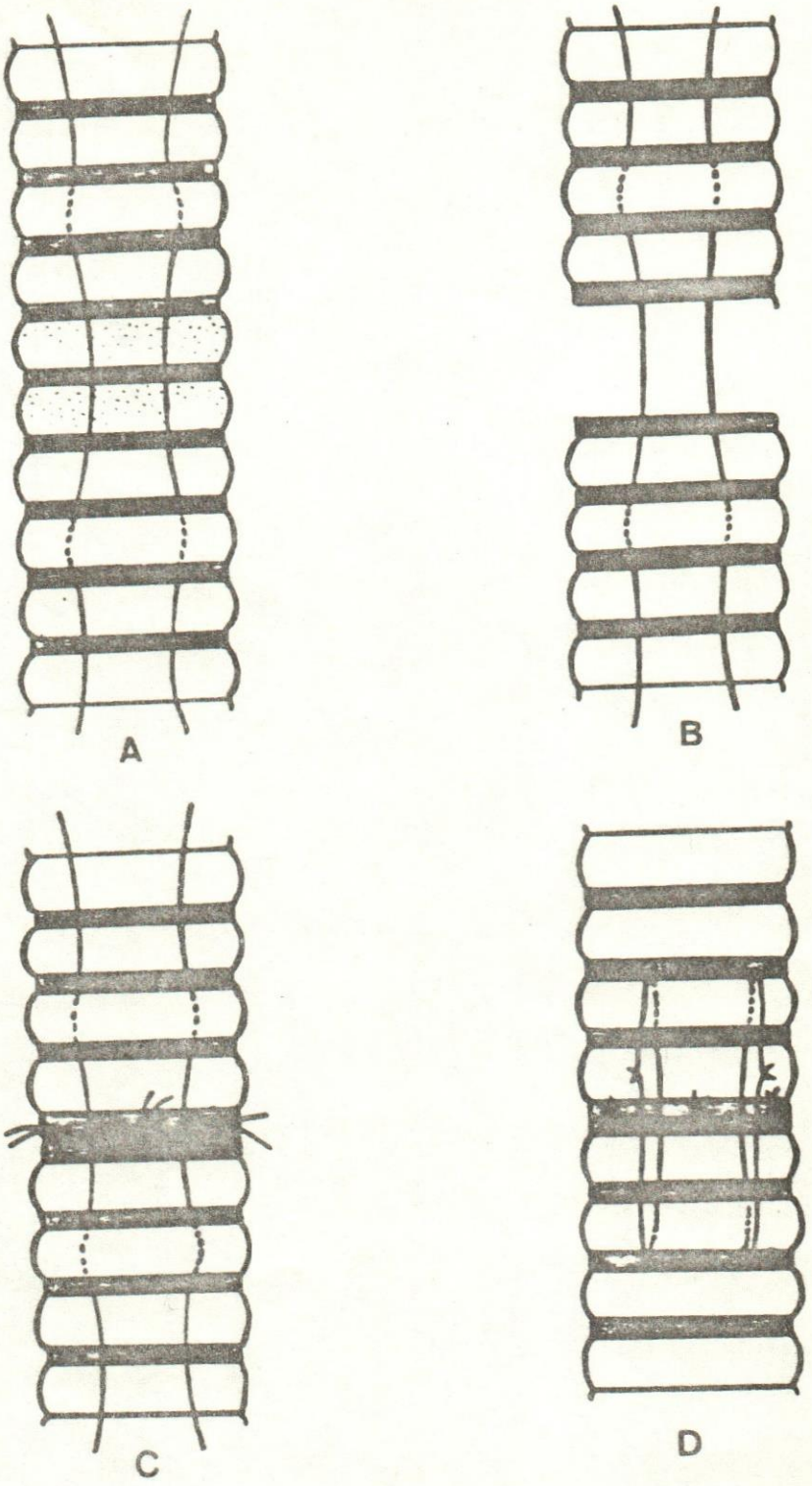

Fig. 1: DIAGRAM SHOWING METHODS OF RESECTIONS AND SUTURE TECHNIQUES.

(A) Application of stay stitches before resection,

(B) Resection of two tracheal rings,

(C) Application and knotting of interannular interrupted stitches,

(D) Knotting of the stay stitches.

Fig. 2: Showing full extension of the neck in cases of 10 tracheal rings resection one week postoperatively.

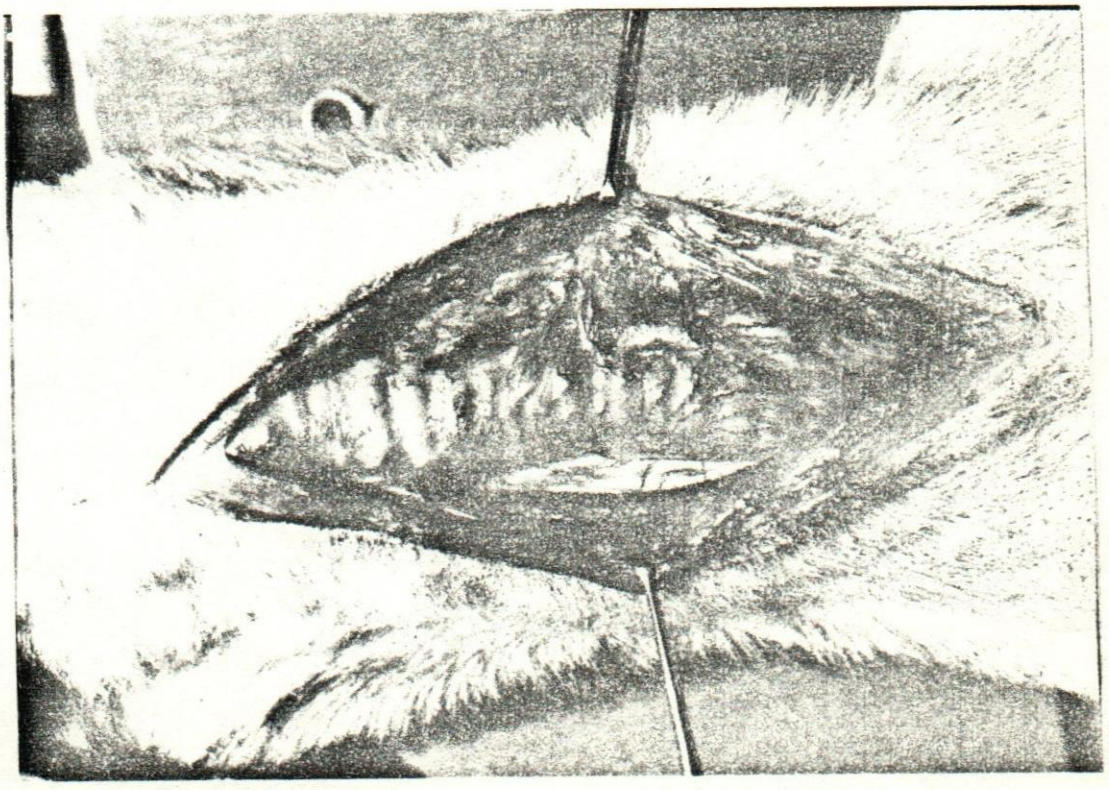

Fig. 3: Showing moderate adhesions between the operated part of the trachea and the surrounding structures (10 rings resection and 6 months postoperatively).

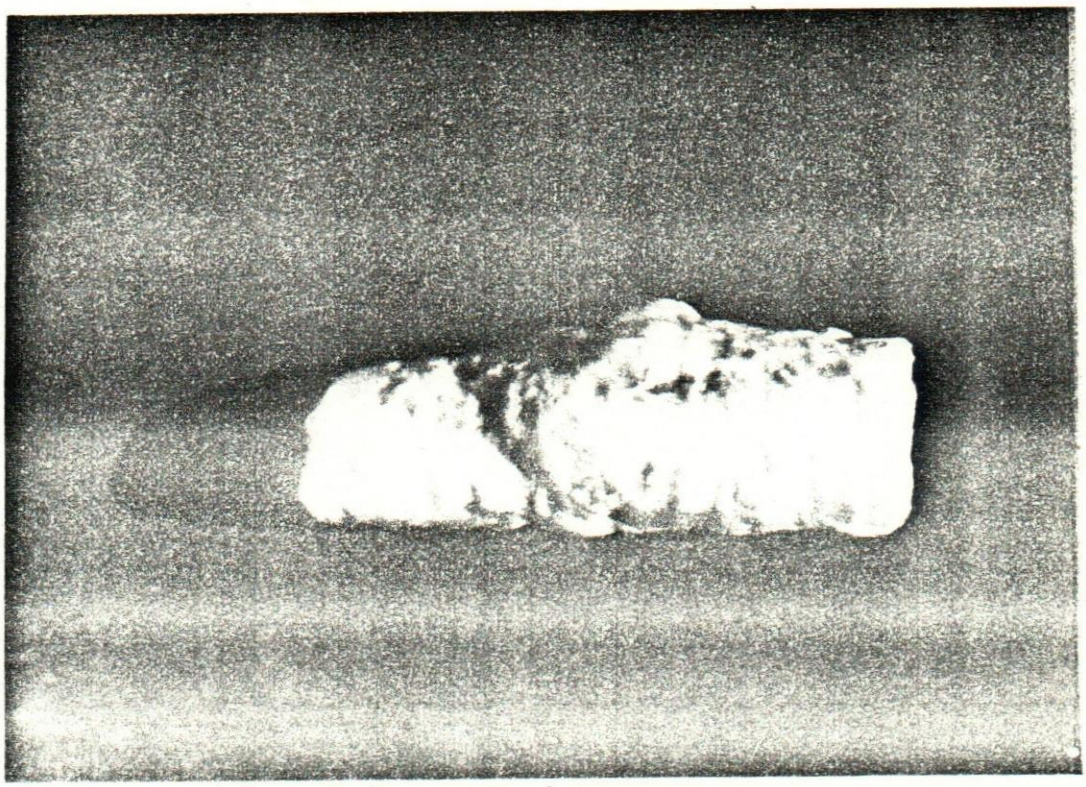

Fig. 4: Showing that the suture material was completely imbeded inside the tissues (15 rings resection and one month postoperatively).

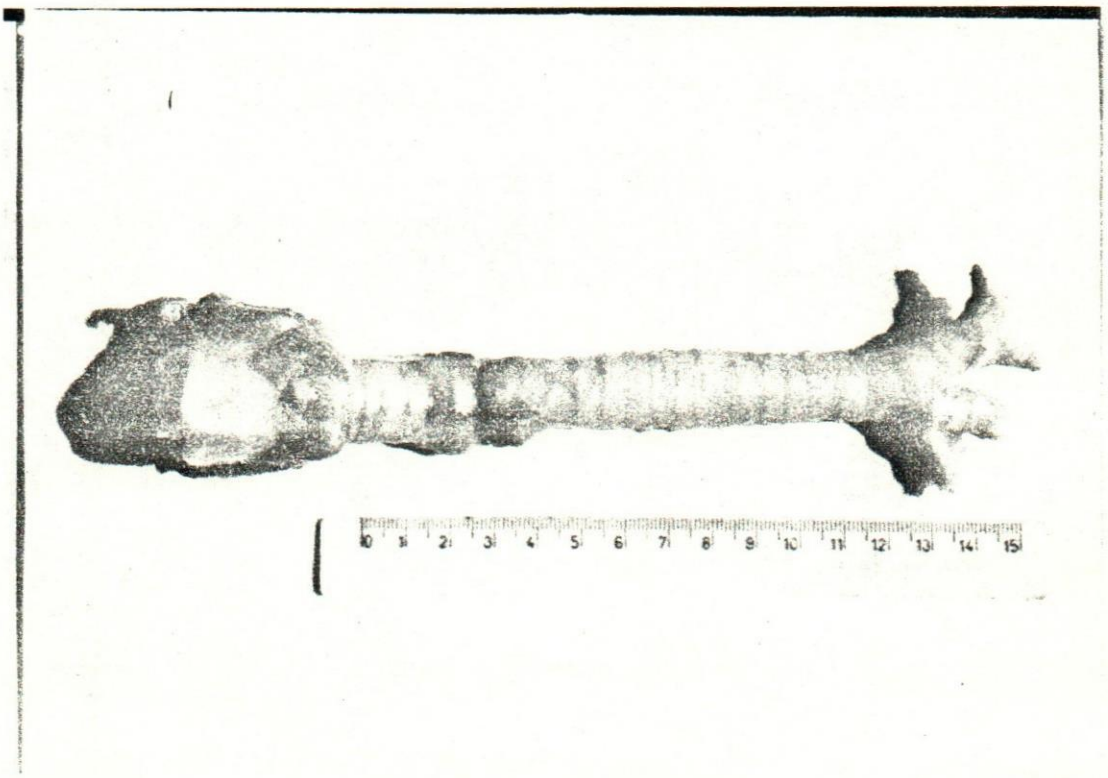

Fig. 5: Showing the presence of the suture materials of stay and interannular stitches clear without any surrounding tissues. (19 rings resection and one month postoperatively).

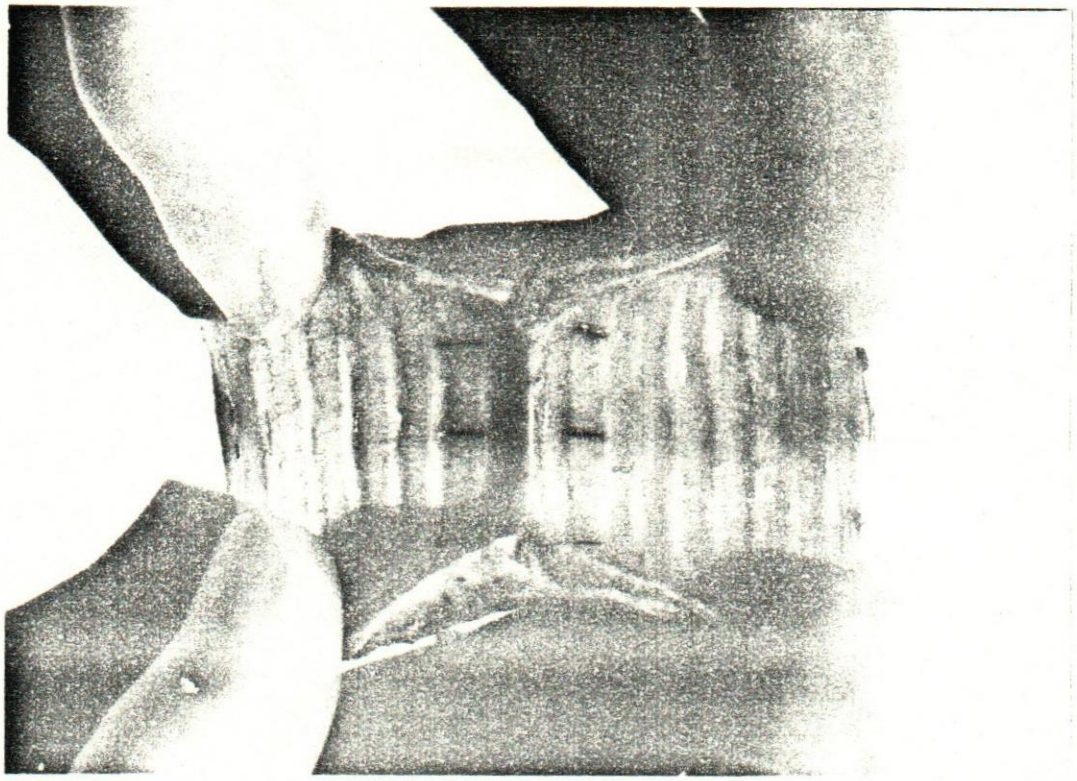

Fig. 6: Showing:
1- The suture material of the interannular stitches imbeded inside tissues and covered by a mucous membrane.
2- The suture material of the stay stitches are clear (5 rings resection and one month postoperatively).

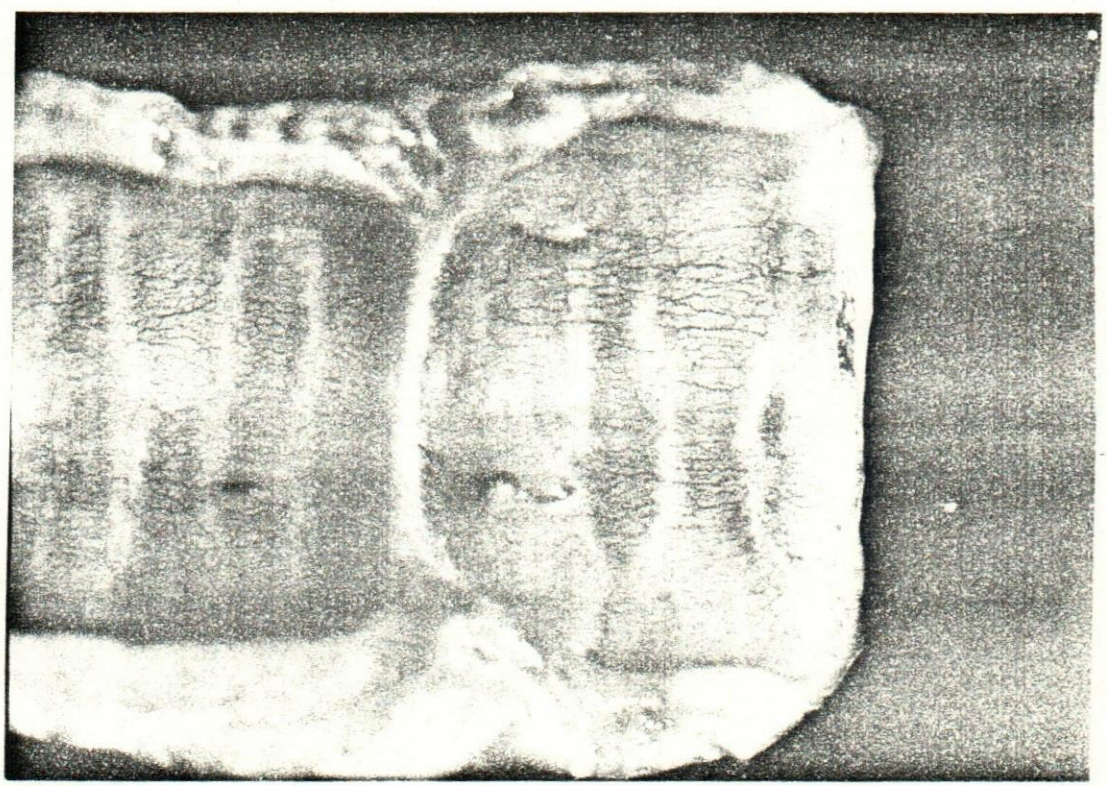

Fig. 7: Showing the presence of suture material of stay stitches imbeded inside tissues. (10 rings resection and one month posotoperatively).

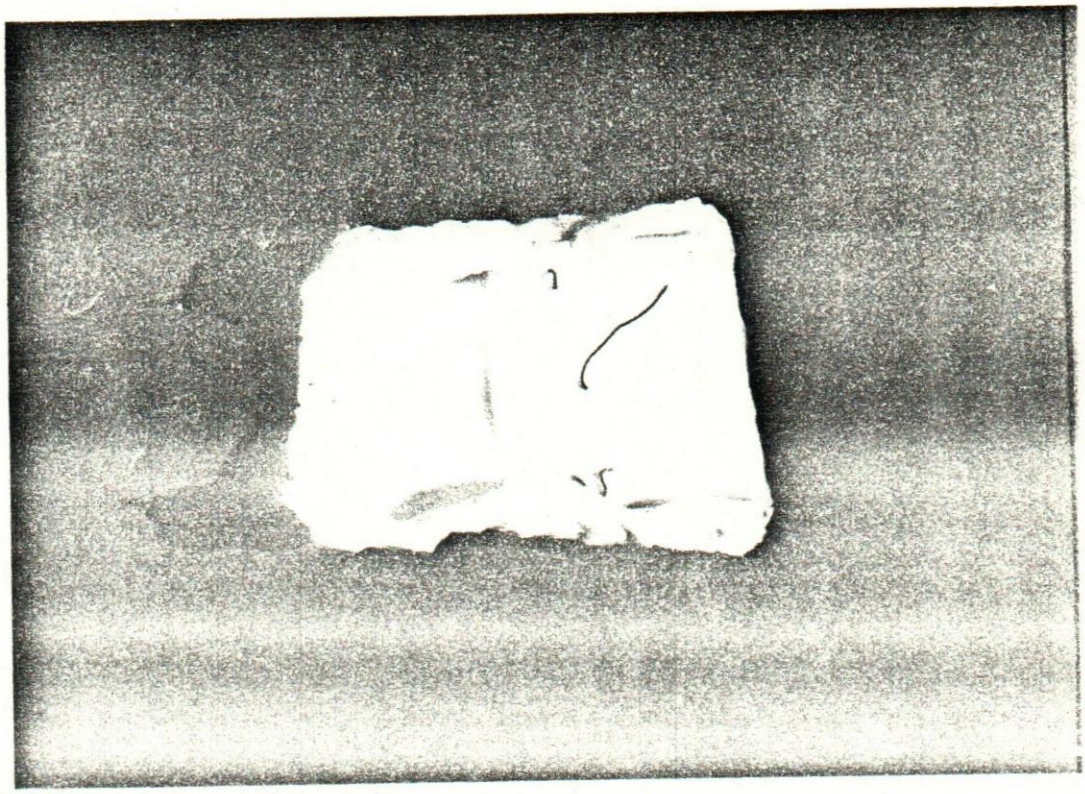

Fig. 8: Showing partial extrusion of the suture material of stay stitches toward the tracheal lumen (15 rings resection and two months postoperatively).

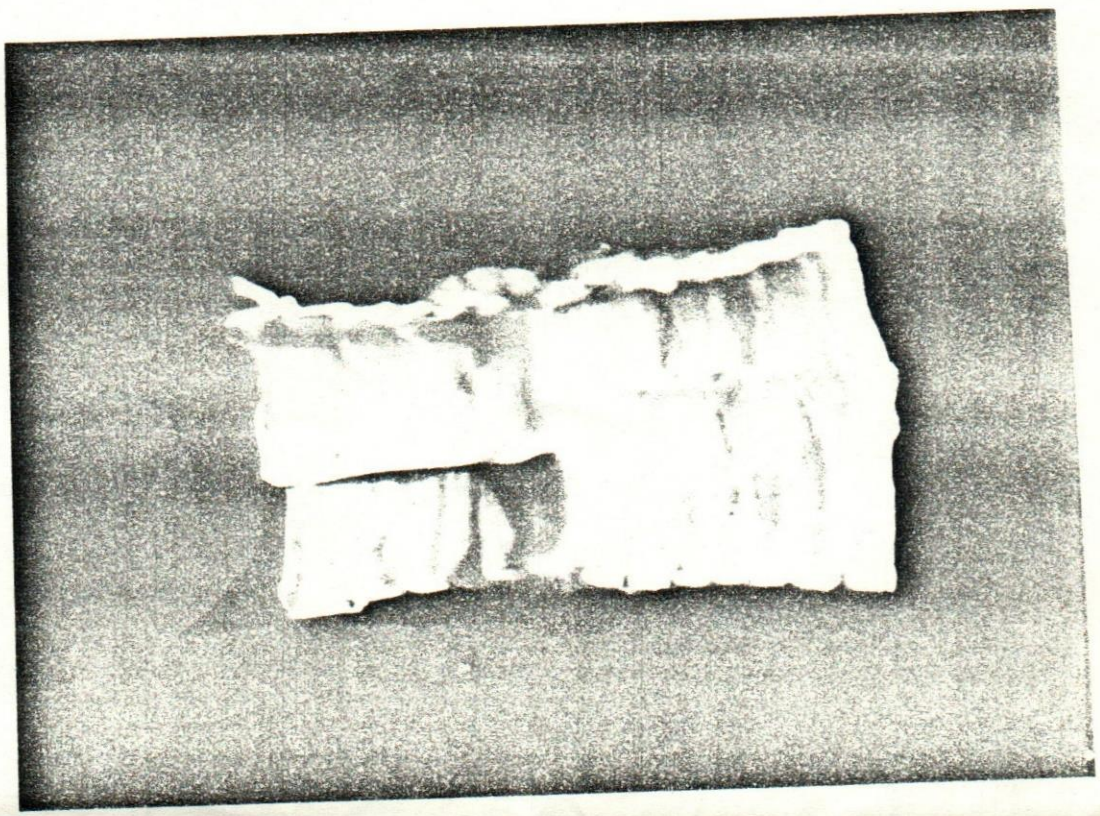

Fig. 9: Showing small scars after complete extrusion of the suture material of stay stitches. (15 rings resection and 3 months postoperatively).

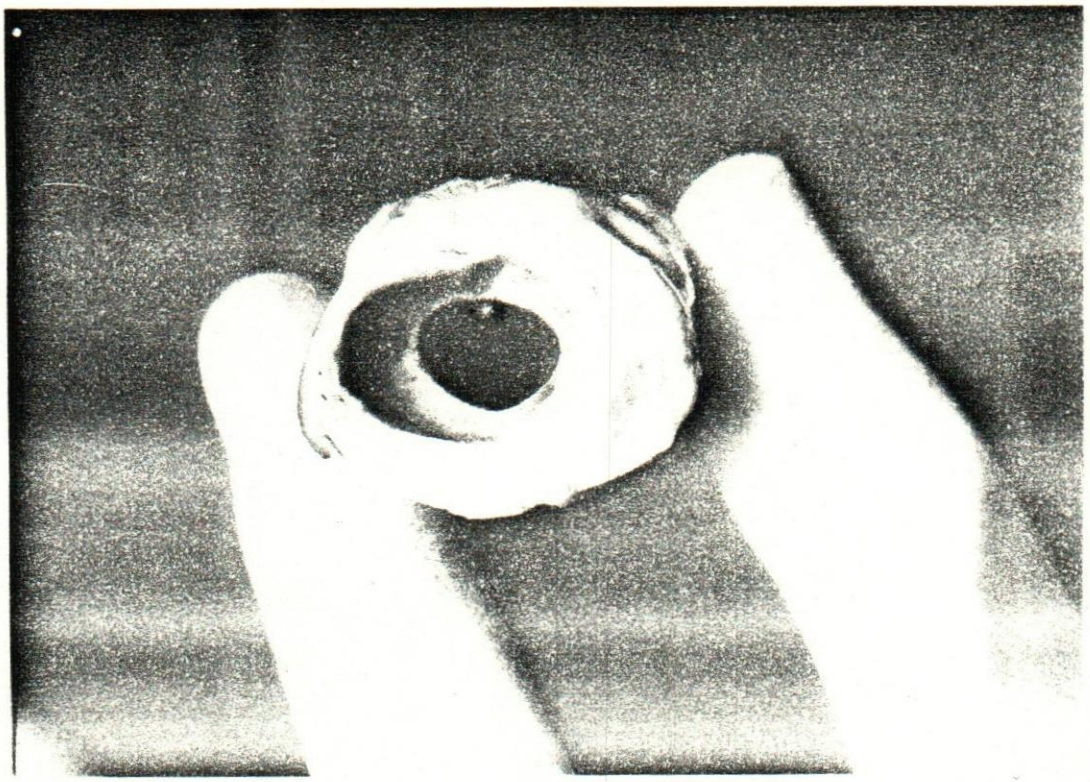

Fig. 10: Showing thickening of the tracheal wall at the seat of anastomosis. (10 rings resection and one month postoperatively).

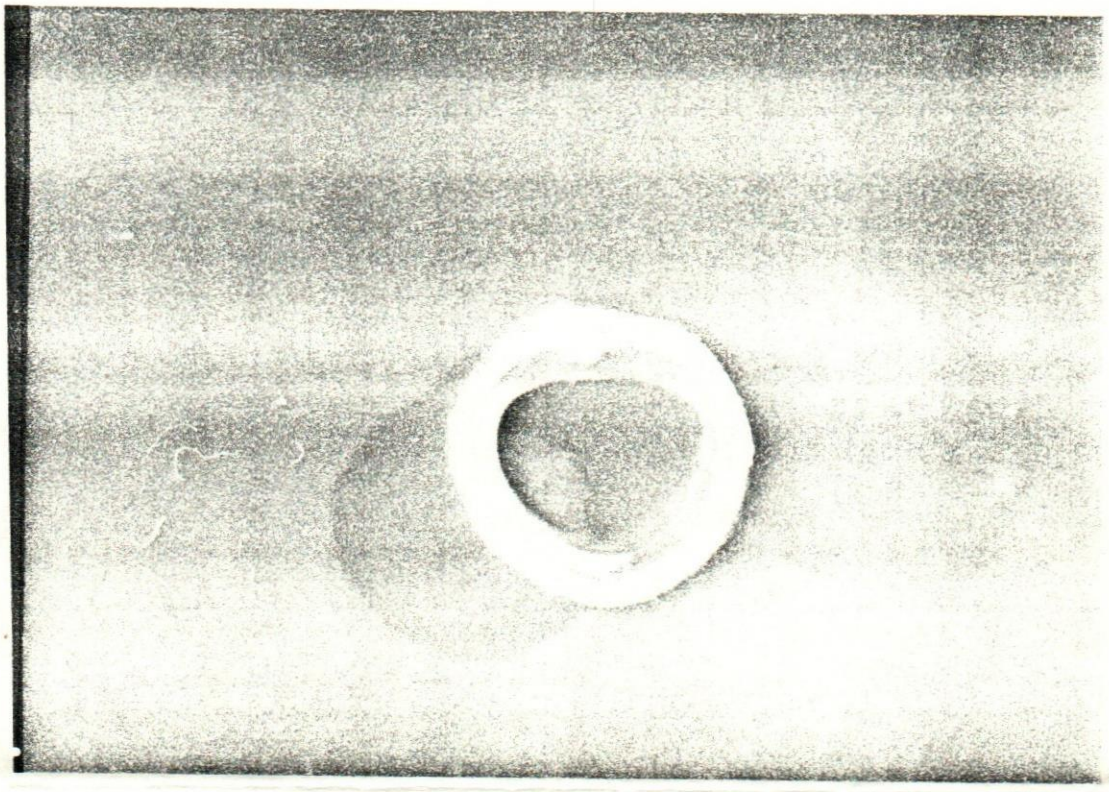

Fig. 11: Showing formation of a small membranous ridge in cases of 5 rings tracheal resection (one month postoperatively).

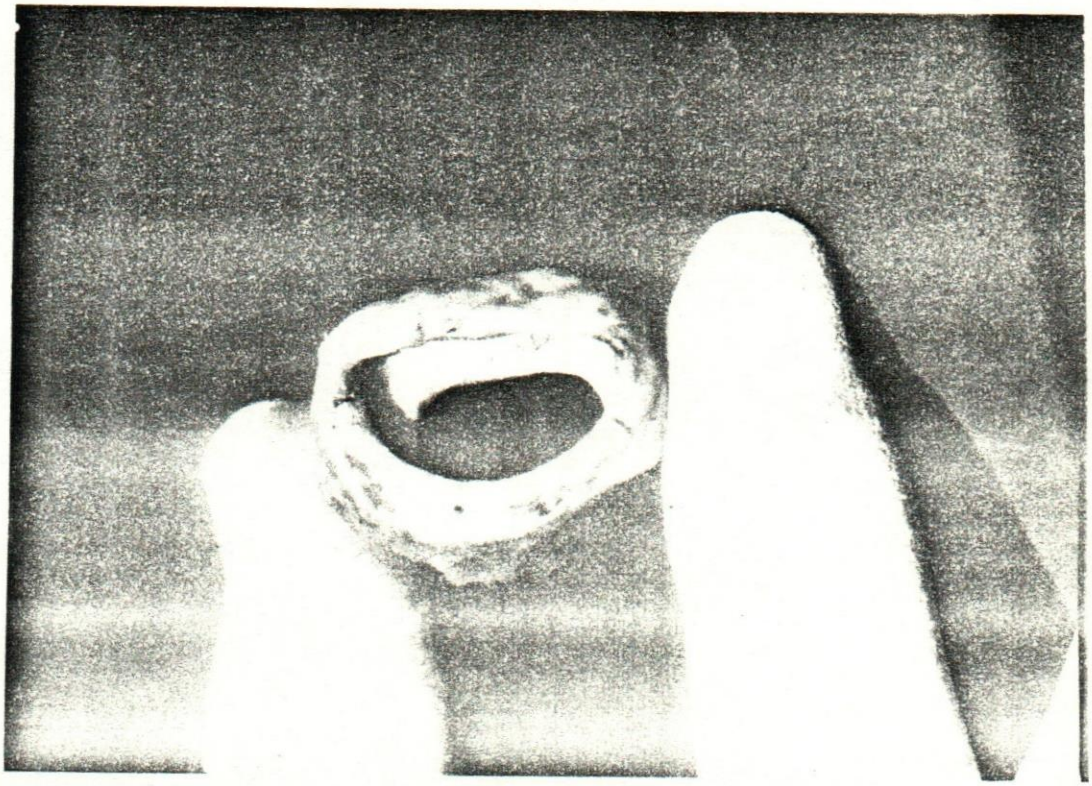

Fig. 12: Showing formation of a wider membranous ridge in cases of 10 rings resection than 5 rings in Fig. 14. (one month postoperatively).

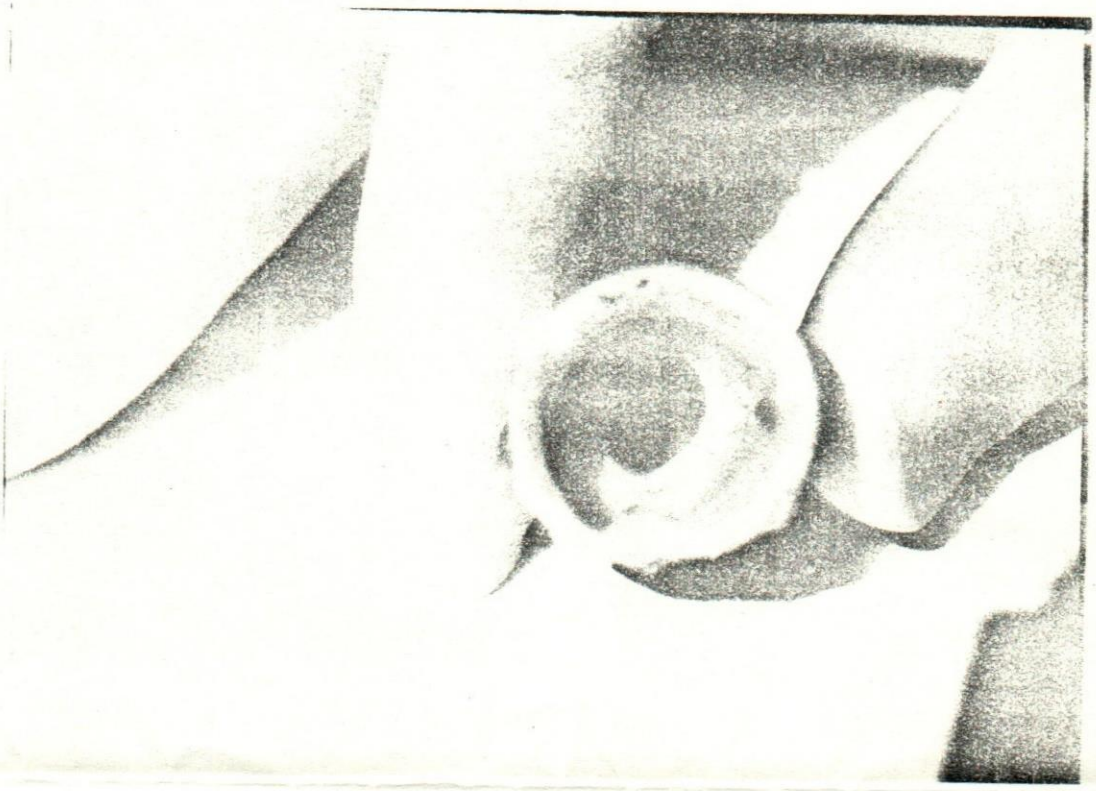

Fig. 13: Showing formation of a large stenotic membranous ridge in case of 19 rings resection. (one month postoperatively).

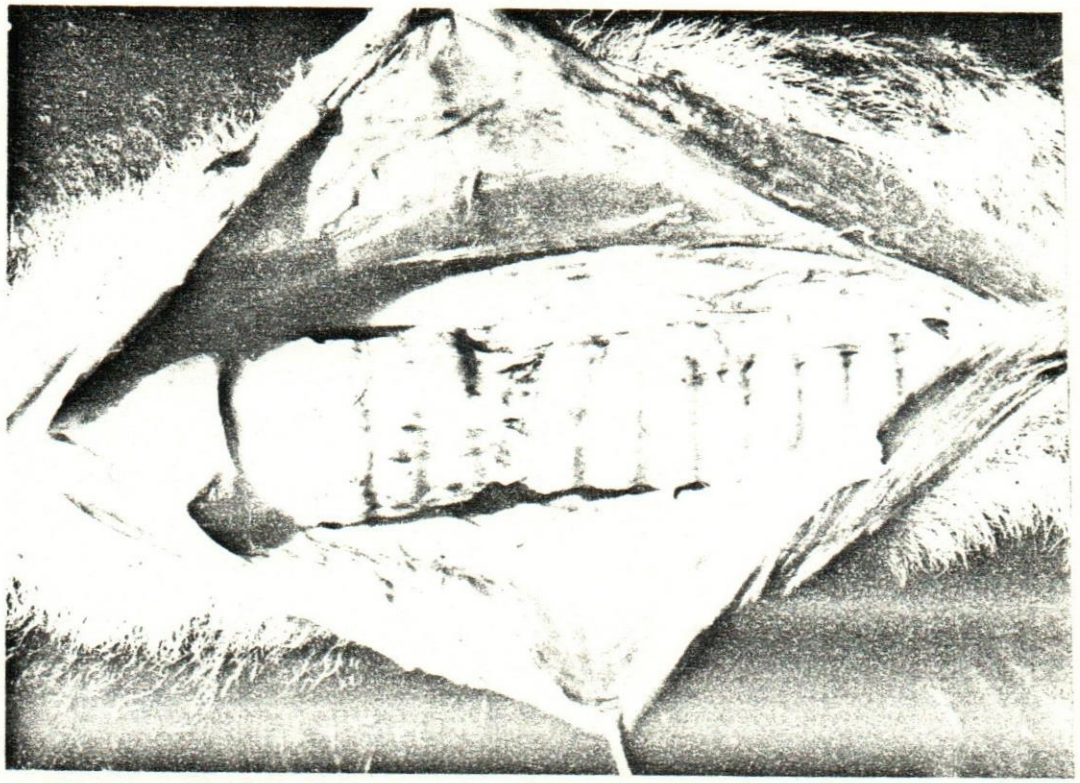

Fig. 14: Showing formation of a wide membranous circumferential depression at the line of anastomosis. (10 rings, chromic catgut 3/0 and one month postoperatively).

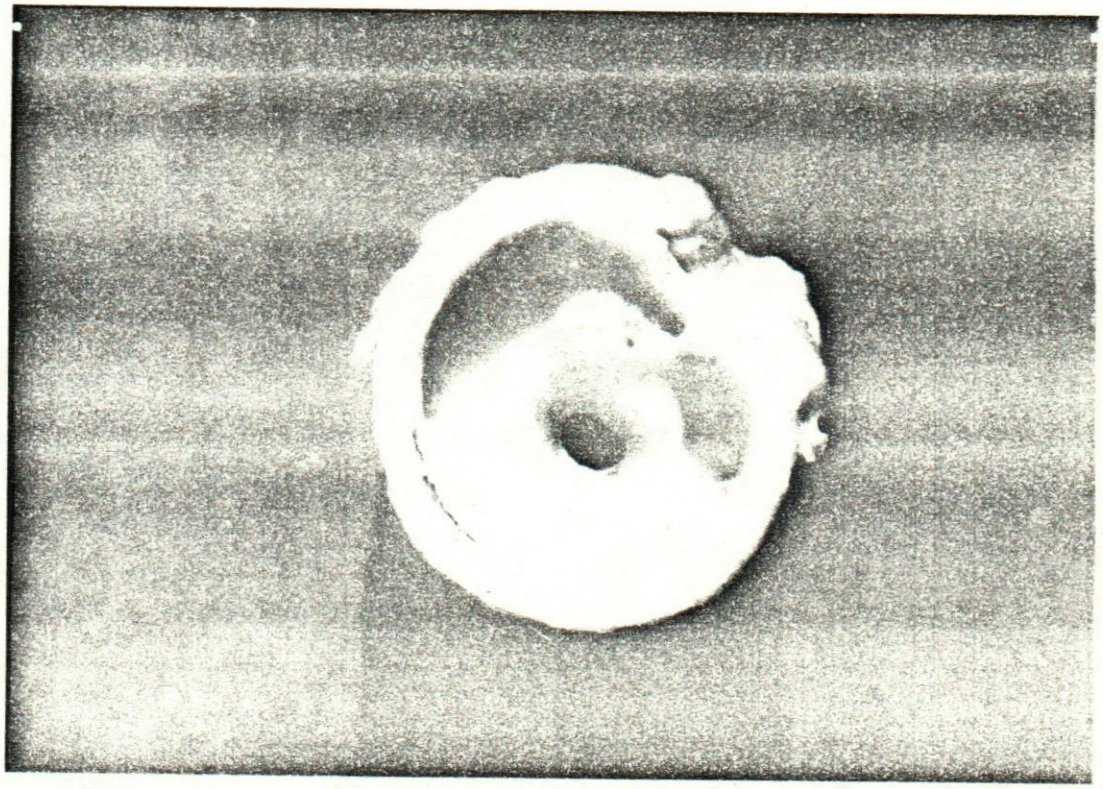

Fig. 15 Showing severe stenosis of the tracheal lumen due to formation of a large membranous ridge at the line of anastomosis. (10 rings resection, chromic catgut 3/0 and one month postoperatively).

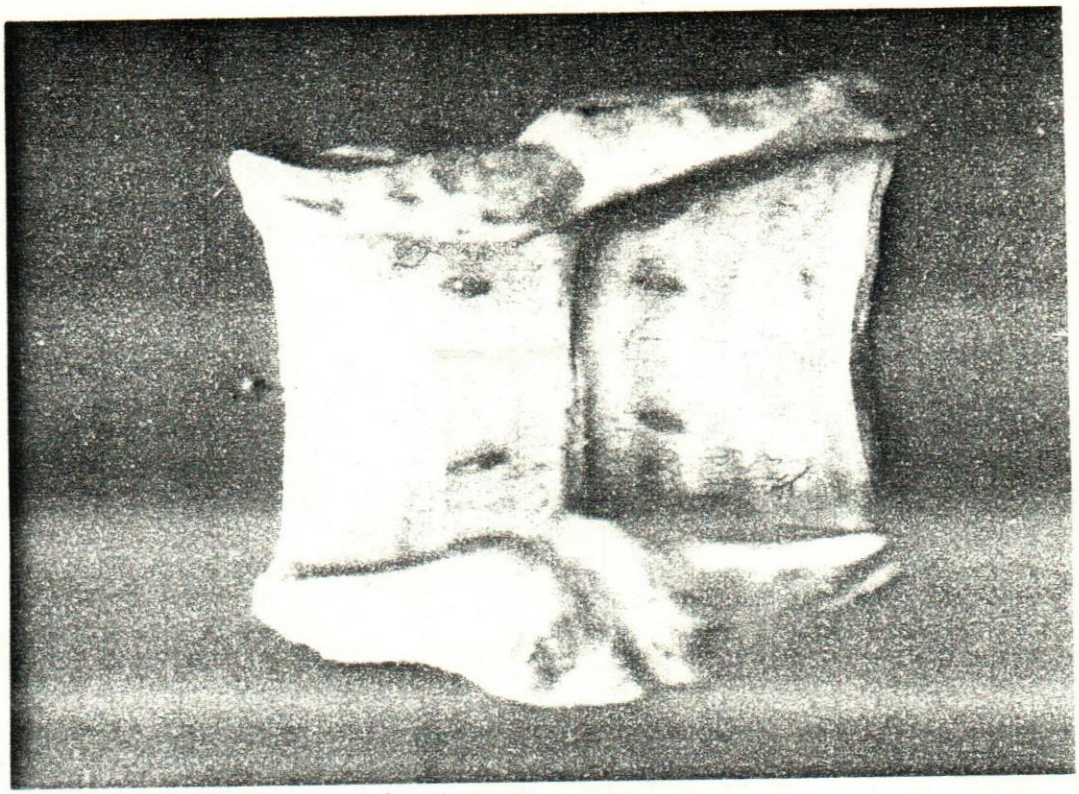

Fig. 16: Showing small stenotic ridge after application of stay stitches alone (5 rings resection and one month postoperatively).

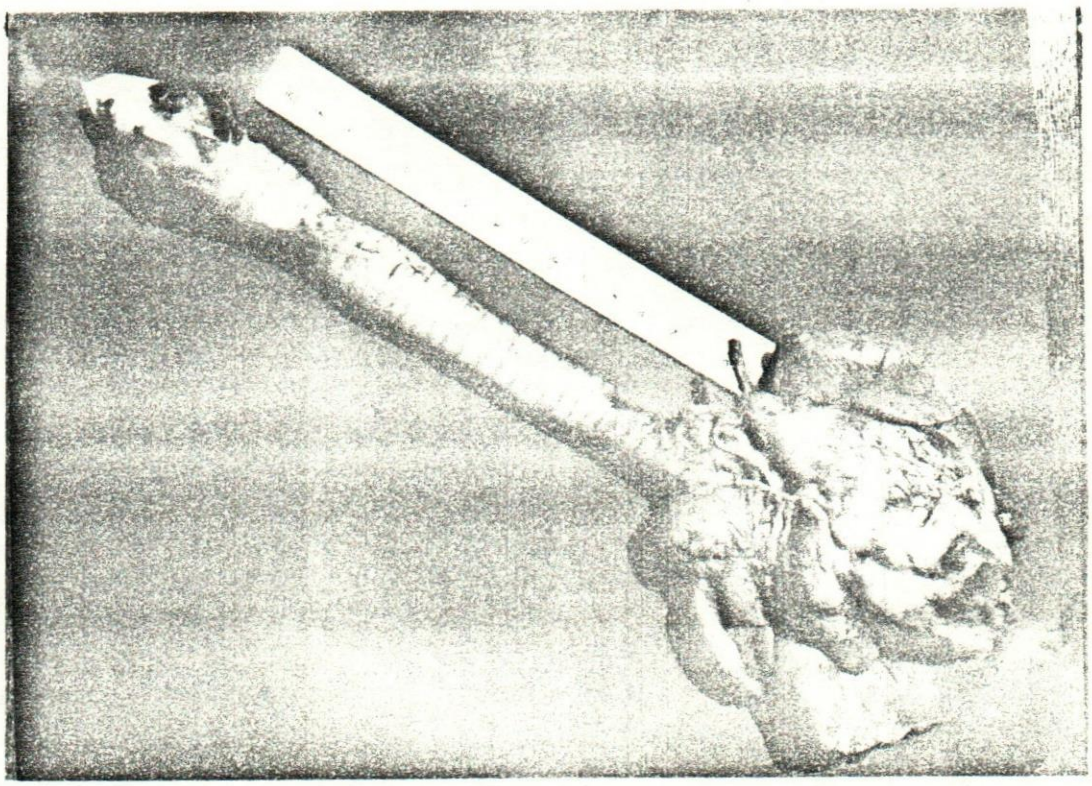

Fig. 17: Showing circumferential depression at the seat of anastomosis after application of interannular interrupted stitches (10 rings resection and one month postoperatively).