MICROSURGICAL ANASTOMOSES OF THE OVIDUCT : A REVIEW OF EXPERIMENTAL MICROSURGERY

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SUMMARY

A review of microsurgical approach is presented from world literature followed by methodology of experimental microsurgery as applied to the rabbit fallopian tube, which satisfies most of the criteria as that of a live, in vivo human fallopian tube. Operative technique, anaesthesia, use of microscope, specific microsurgical instruments, Bipolar coagulation silicon sheet, continuous irrigation system, microsutures, post operative care, have been explained. Statistical Assessment of Tubal function has been designed to compute the quality of success rates and improvements that may be necessary. The research model helps in updating and comparing various methods of tubal reconstruction, including the application of fibrin glue for tubal anastomoses.

INTRODUCTION

Seigler &Perez 1975 reported on conventional surgery for reversal of sterilizaction resulting in 22% pregnancy rate with conventional techniques. In 1977, Seigler commented on tubal microsurgery that magnification of X 30 gives a better prognosis for successful anastomoses than X4 or no mag nification at,this all remains to be proved. Fewer than 100 tubal reconstruction have been reported in which an operative microscope was used. Fertility was restored in 60 to 70% of these women, with one ectopic pregnancy. Seigler attributes increased pregnancy rates to other factors other than microscope, such as so called microsurgical principles of gentle tissue handling, 8/0 sutures, bipolar coagulation. However, he

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Accepted for Publication in Jan '95.

remained sceptical, about the importance of microsurgery. In 1978 Seigler pesented an analysis of macrosurgical and microsurgery techniques, in the management of tubo-peritoneal factors in infertility, discussing the results of the last 80 macrosurgical and first 80 microsurgicals intervention for infertility. His pregnancy rate of 12.5% following conventional surgery improved to 28% when he used microsurgery. He summarises increasing experience with microsurgical techniques for tubal reconstruction and suggests that this approach does improve the post operative pregnancy rate.

These three papers by Seigler give an impression of how experienced infertility surgeons were first were scepitcal about the effect of microsurgery, but later changed their well established methods to employ microsurgery.

Khoo and Mackay in 1972 reported on the pregnancy outcome of rabbit tubal anastomoses using 4/0 catgut and 0.6 mm polyethylene splint, left for 2 to 24 weeks achieving pregnancy only in 3/24 animals.

Patersone and Wood 1974 reported to a 60% pregnancy rate in following microsurgical anastomoses in rabbits. Winston reported a 92% pregnancy rate in 25 rabbits using nylon sutures, removing splints at end of procedure.

MATERIAL AND METHODS

1. Choice of Animal for Experimental Microsurgery :

The Rabbit is an ideal model because it has a double ovary, oviduct, uterus and cervix, allowing one side to be used for control. Moreover, ovulation is stimulated by compulation, which makes it highly convenient for experiments of this type. The size of the rabbit oviduct is similar to the human tubal isthmus and the rabbit is therefore a good training model for human surgery. Most available data concerning tubal functions, studies have come from rabbit experiments. Studies have come from rabbit experiments.

Female New Zealand white rabbits weighing 3000-4000 gms, with no previous operation, were used, having starved 12 hours prior to surgery.

2. Anaesthesia :

Inhalating anaesthesia in an half open system, was given after intramuscular induction with Hypnorm (R) (Duphar Belgium). A mixture of Fentanyl and Fluanizone, which is a neurolyptic analgesia ideal for animal use, given as 0.4 mg/kg body weight. 5 minutes after induction, 0.8 litre/min

Fig. 1 : Rabbit anaesthesia. In half-open inhalation anaesthesia system oxygen and nitrous oxide and Fluothane are given.

Oxygen, 3-5 litres/min Nitrous oxide, with 0.6% to 0.8% Fluothane mixture was supplemented through a mask. (Fig 1.).

3. The Microscope :

A Zeiss OPMI 6 or OPMI 7 was used (Fig 2.), fitted with 200 mm focal length lens and X12 eye pieces, and 160 mm binocular tubes.

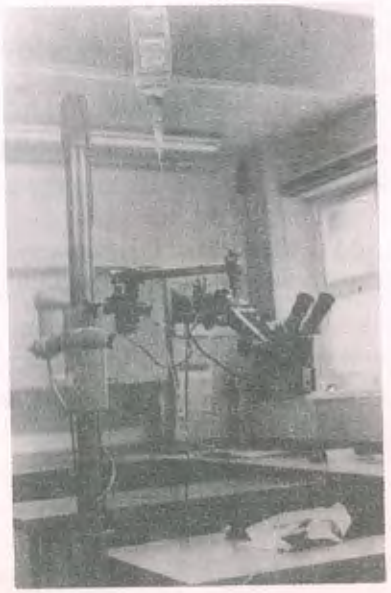

Fig. 2 : Operation microscope : An electric foot pedal controlled zoom microscope. The continuous irrigation system is attached between the left and right optical axis of this stereomicroscope.

Electrically foot controlled zoom microscope provided magnification of X8 X25, to allow easy indentification of different tubal structures.

4. Microsurgical instruments :

Scissors : Castroviejo and Vannas microscissors were used. Blunt scissor are less likely to damage the peritioneal surface and small blood vessels around tubal muscle coat. Straight sharp pointed Vannas scissors, 7 cm long were used to trim back abundant mucosa and cut stitches.

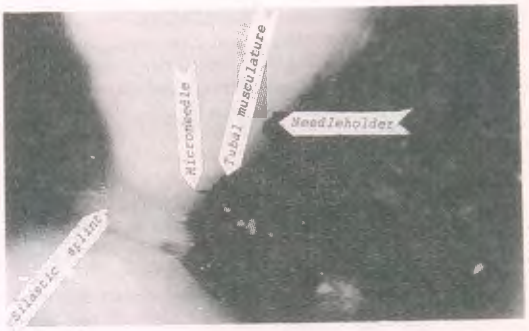

Fig. 3 : Anastomosis of the rabbit oviduct : First layer. The first stitch is placed at the mesenterium of the oviduct and includs only circular muscle coat. Methylene blue dye has resulated in a dark field.

Needle holder : an O'Brien ginch needle holder with small angulated jaw was used for suturing the oviduct with

Fig. 4 : Anastomosis of the rabbit oviduct : Second layer. The distance between the stitches is 0.2 mm. Only the serosa is included. The mucosa is not sutured.

70 micron needles, positioned at right angles to suture line. The round bodied handle allows easy rolling of the needle at a 3/8 the circle movement.

Microforceps ; Dumont's Jeweller's forceps for dissection of oviduct and for suturing with 10-0 stitches. according to Beockx, et al 1980.

Tubal Clamps : The Acland Winston tubal clamps, with semi-sircular tip which compresses the oviduct without occlusion of its lumen. Only the blood vessels in the tubal wall are occluded keeping blood loss minimal 1 mm diameter clamps were used-see.

Bipolar congulation : A Fisher-Met Bipolar cautery was used to obtain linear bipolar congulation, with high frequency electric current through insulted jaws of Jeweller's Forceps, enabling coagulation of 0.1 mm diam. Vessels without burning surronding tissues, or producing circular burns. Splint : A 0.45 mm thick poly-ethylene splint was used to stablize the oviduct after the transection. (Winston & Margara. 1980)

OPERATIVE TECHNIQUES

An incision made in angle between inguinal ligament and lateral margin of rectus abdominis, 4m long,3 cm above pubis. After achieving adequate haemostasis, uterus and oviduct were exposed by retracting the bladder. The tubal segment was delivered through incision and placed on 3 cm wide by 4cm stainless steel platform (Boeck et al 1980). Looked on to main operation table. A silicon sheet, 1.5 mm thick was placed under oviduct for protection. Continuous irrigation at 37 degree Ringer's lactate, was employed to prevent drying.

MICROSURGICAL TUBAL ANASTOMOSES

The isthmus-ampullary segments was exposed, and under high magnification after adjusting the microscope, using Vannas scissors, a small incision in the tubal mesentry was made, at the site of anastomoses. Blood vessles parallel to the oviduct were coagulated. Tubal clamps were applied across oviduct, which was transected with Castro-viejo scissors, and both cut ends were irrigated, and bleeding vessels from the edges coagulated under direct micro-scopic vision.

The tube was splinted across, and along, uterine end, reaching the horn, allowed to perforate for later access to removal, the lateral end of the tube was then, splinted along fimbrial direction for 3 cms.

The tube was thus stabilised by tubal clamps and splint within, keeping anas-tomotic sites into close apposition. See Fig 4.

Circular Muscle coat was sutured, without including the mucosa. (see Fig 3). -8 stitches of 0.3, mm bite, at distance of 0.2 mm were sufficient to perform the anastomoses. The stitches were not knotted too tight (Fig 4.), maintaining the blood supply across the anastomoses. Having completed anterior half of anastomoses, oviduct was rotated 180 degrees to complete, and splint taken out. The gap in mesentry was closed with 2-3 supplementary 10-0 nylon stitches.

The abdominal cavity was washed with warm Hartmanns (Ringers). Solution before the oviduct was replaced in the abdominal

cavity, and the incision closed in three layers.

Post-operative Care: The rabbits recovered in a warm cage, and feeding started the morning after the operation.

Ampicillin was given intramuscularly for three days. Three weeks after the operation, the animals were mated three times in day with a fertile buck.

FIBRIN GLUE TECHNIQUE OF TUBAL ANASTOMOSES

Fibrin glue was prepared by adding bovine aprotinine to a clottable protein complex of fibrinogen, plasma fibronectine, factor XIII, and plasminogen. Another component was prepared with Thrombin 500, Bovine Freeze Dried, added to calcium chloride. Fibrin Glue and this component formed an effective Sealant Glue by quick polymerisation. The cut ends of the tubes were brought close together over 4.0 mm diameter polythylene silastic splint and the tubal clamps, tied closely for best apposition. One drop of Fibrin glue was dropped on the anastomoses through micro scopic control, and immediately, 1 drop of reconstituted thrombin 500, with calcium chloride added, resulting in a viscose fibrin glue and thrombin solution that quickly sets to form a white elastic rubber like mass, which firmly adhreres to the tissue, resembling physiologcal coagulation process. Silastic splint was removed after anastomoses and abdomen closed 6 weeks later, under operation microscope, the tubes were assessed along through a midline incision. After localising the sites of anastomoses, biopsies were taken with scissors, and split longitudinally, and fixed in 6.25% gluteraldehyde, in colloidine buffer, postfixed in osmium tetraoxide, dehydrated and embedded in wax. One micrometer sections were stained with Methylene blue and examined by light microscope.

CONCLUSION

The research methodolgy on rabbit model for experimental microsurgery has been explained. Based on this model, several studies have been performed, including Histological comparison of Microsurgical versus Fibrin Glue Anastomoses, of the Fallopian tube.

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