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Editorial

FUNCTIONAL PARAMETERS OF THE FALLOPIAN TUBE

It is elementary knowledge that patency of the fallopian tubes is absolutely necessary for fertility. But patency is just one aspect of tubal function. In conditions like tuberculosis, endometriosis and following tubal surgery often pregnancy does not occur inspite of patent tubes. There is much more to tubal function than mere patency

Apart from providing a free and unhindered passage to the sperm, ovum and fertilised egg the tube also provides nourishment to all of them. This nourishment comes from secretions of the tubal muscosa.

Even the passage of the sperm ovum and zygote through the tubes is not a passive function and mere lack of obstruction or blockage is not enough. Tubal peristalsis and ciliary movements actively control this transportation. Picking up of the ovum released from the follicle is an active function of the tubes. Thus apart from anatomical integrity functional competency of the tubes is equally essential for reproduction.

Ovum Pick-up

At the time of ovulation utero-ovarian ligaments contract. This is coupled with contractions of the muscle fibres along the ovarian fimbria. The result is a complicated manouvre of the infuncibulum sweeping over the ovarian surface at ovulation and picking up the liberated ovum. Ciliary movements play an important role in this. Negative pressure of 1 mm Hg is demonstrated in the ampulla. This suction aids the ovum pick-up. Lastly, direct ciliary contact with the cumulus of the egg also seems important in egg pick-up. Yet, pregnancies are known to occur with just one tube and the only ovary situated on the opposite side. Obviously, this is due to transperitoneal migration of the released ovum and its being picked up by the opposite tube.

Nourishing secretions of the tube

Soon after fertilisation the ovum embarks upon cell division. This rapid multiplication of cells needs nutrient energy which comes from tubal secretions. Undamaged tubal muscosa and normally functioning secretory cells are necessary for reproduction.

Tubal Passage

The tube must provide free and unobstructed passage to the ovum, sperm and fertilised egg. Intraluminal adhesions can interfere with this transportation and result in tubal pregnancy. Besides tubal patency, intact mucosa free from adhesions in the lumen, absence of kinking adhesions on the surfaec, normal ciliary activity and good peristaltic movements are all mandatory for successful reproduction.

The passage of the fertilised egg through the tube is controlled with precision. Too hurried a passage will lead to premature arrival of the egg in the

uterine cavity before the endometrium is ripe for implantation and result in its exit through the cervix. While sluggish, delayed or obstructed passage will lead to the growth of the fertilised egg to a stage where it desperately needs more nourishment, has already acquired the trophoblastic borrowing apparatus and attempts implantation in the tubal mucosa leading to tubal pregnancy. The duration of sojourn of the fertilised egg in the tube varies with the species. In humans it is 72 hours. In lower animals the fertilised egg is held up at the isthmo-ampullary and tubocornual junctions and anatomical sphincters are contemplated at these sites. There are species differences in the relative importance of the delay at the ampullary isthmic junction. The precise timing of egg travel is critical for successful implantation. Deliberately delayed and sluggish passage through the isthumus apparently allows the endometrium to get ready for implantation. In human tubes no sphincters are demonstrated. But the isthmus with its preponderence of circular muscle fibres can serve as a sort of a sphincter. According to one hypothesis estrogen increases alpha adrenergic activity leading to isthmic contraction and delay or cessation of progress of the fertilised egg while progesterone increases beta receptor activity causing isthmic relaxation and permitting egg travel into the uterus. In clinical practice, all types of hormonal contraceptions including postcoital pills result in increased risk of tubal pregnancy.

Assessment of tubal function

We have excellent and adequate tests at our disposal to assess tubal patency and anatomy. Recent introductions of tubaloscopy and tubal microbiopsy are valuable additions to our ability to study the tubes anatomically. But our ability to assess tubal function is limited. Until recently, normal looking patent tubes were presumed to function well but it is not always so. Pressure fluctuations seen on kymographic tracings at Rubin's test are believed to indicate tubal peristalsis. There is no complete agreement on this. Besides, when the tubes are blocked at the uterine end, tubal peristalsis even when present cannot be reflected by pressure fluctuations on the kymograph. Like all muscular activity tubal peristalsis is also accompanied by electrical action potential changes in its musculature. In animals, the propagation of electrical activity and its pattern can be studied by a series of electrodes applied to the surface of the tube and this could reflect tubal peristalsis. In rabbits, microsurgically repaired tubes are demonstrated to generate action potentials and conduct them across the anastomosis thus presumably indicating restoration of tubal function. Hopefully, specially designed electrodes may, in future, enable us study action potential changes through the laparoscope in women. Ciliary activity of the tube is crucial and 70% of fimbrial epithelial cells are ciliated. The functional integrity of the ovum pick-up mechanism, ciliary activity and tubal peristalsis can be ascertained by spraying surrogate ova over the ovaries or in the pouch of Douglas at laparoscopy, abdominal paracentesis or culdocentesis. Arrival of these surrogate ova at the cervix confirms normal tubal function on at least one side. Surrogate ova should be completely non-irritant, have the same size as human eggs and be easily identifiable. Starch granules were tried, but being irritant were given up. Dextran particles have been tried also. Radioactive surrogate ova are being experimented with as there progress through the tubes and the uterus can be continuously monitored. Tubal secretions are vital for nourishment of the gametes and zygotes. Tubal secretions are under close scrutiny, thanks to IVF programmes. In future, we may routinely obtain tubal secretions for study at laparoscopy and tubaloscopy. Practical tests for the various aspects of tubal function is the need of the day. Once we have these tests, pharmacological correction or alteration of tubal functions like egg pick-up, peristalsis and secretory activity could enable us treat tubal infertility and also control fertility for contraception.

MAHENDRA N. PARIKH