A VAGINAL RADIUM APPLICATOR FOR CERVIX

By

K. H. Khalid, M.D.
Radiology Dept.

Prof. Mahrous M. A., Ph.D.
Physics Dept.

A. E. H. A. Hage, M.D.
Radiology Dept.

Ain Shams University

INTRODUCTION

Radium treatment in case of cancer of cervix uteri is composed of an intrauterine part and a vaginal part. All techniques use the same intrauterine tandem but different vaginal applicators. After studying the effect of mobility of the pelvic viscera on the dose received by the pevlic lymph nodes, the need for a vaginal applicator became necessary.

APPLICATOR

A perspex vaginal applicator was devised according to the Manchester ovoids taking in consideration the size of the vagina and it was built in three sizes :

Size of Vagina	Trans. diam.		A.P. diam.	
	of vagina	of applic.	of vagina	of applic.
small	—5 cms	4	—3 cms	2
medium	6.5 cms	6.5	3.5 cms	3
large	7.5 cms	7.5	4 cms	4

Sheets of perspex were gummed together by fluid perspex and then were cut to the above sizes in the shape of ovoids, with spacer in between. The handle holding them being in one piece with the ovoids and spacer. This handle has an anterior groove so as to accomodate the urethra and not press upon it. The lower end of this handle is of sufficient length so as to protrude outside the vulva and at its end a hole is drilled. Straps pass through this hole, two anteriorly and two posteriorly. Their ends are tied to a belt round the waist of the patient and resting on the iliac crests. In this manner the applicator is firmly fixed in relation to the bony pelivs and at the same time no slipping of ovoids occur.

The applicator is of the following weight, the small is 75 gm, the medium is 100 gm and the large is 140 gm. The perspex from which it is constructed is radiotranslucent as proved by the radiograph while the Manchester ovoids are radiopaque.

PHYSICAL DATA

Theoretical calculations coincided with direct measurments and the following table shows these results. To deliver 6000 r to point A when the distance between the intrauterine tandem and applicator is 2 cms or 3 cms.

Distance		small	medium	large
		a. two tubes intrauterine		
2 cm	dose rate	71 r/hr	71 r/hr	69 r/hr
	time	85 hrs	85 hrs	87 hrs
3 cm	dose rate	67 r/hr	67 r/hr	65 r/hr
	time	90 hrs	90 hrs	92 hrs
		b. three tubes intrauterine		
2 cm	dose rate	72 r/hr	72 r/hr	70 r/hr
	time	84 hrs	84 hrs	86 hrs
3 cm	dose rate	68 r/hr	68 r/hr	66 r/hr
	time	08 hrs	80 hrs	91 hrs

RESULT

Twenty nine cases of cancer cervix were treated by this applicator. Six were treated by the small-sized applicator, thirteen by the medium and ten by the large.

Radiographs were made in every case and proved that the applicator was firmly fixed in its position and no slipping of radium occured.

As the applicator is made of perspex and no gauze was used, no leucorrhoea or offensive smell resulted.

No rectal reaction whether immediate or delayed developed in the cases treated by this applicator.

No case developed retention of urine which is an important factor in the causation of rectal reactions.

As the relationship between the vaginal applicator and the pelvic wall is kept constant by proper fixation, the dose delivered to the lymph nodes in this area is uniform and as calculated.

DISCUSSION

Tod (1938) in a through discussion of rectal injuries following radium treatment of cancer cervix stated that "There is close correspondance between the theoretical technique and the observed positions occupied by the radium after insertion into the patient. However the following is noted : 1. Quite often, overriding of applicators does occur which may produce a difference of 1000 r or more between the two sides of the pelvis. 2. There was also the general tendency of the applicators to slip around in an attempt of the widest diameter of their combined layout to occupy the longitudinal axis of the vagina. 3. In the lateral radiograms it was noted that the ovoids appeared quite often to descend in the vagina so that the uterine tandem could be opposite instead of the centres of the vaginal tubes. This gives lower values to the depth dose at the pelvic wall than those arrived at by calculation. The calculation therefore often represents the maximal dosage under ideeal conditions. 4. An ovoid may rotate so that the radium is no longer at right angles to XY planne and this produces an error of ten percent. 5. The uterus may be retroverted and this increases the dose at point A by twenty percent. The actual dose delivered to the anterior rectal wall in an average case of retroverted uterus is more than 2000 r greater than that received when the uterus is lying anteverted. Such an additional dose is easily capable of determining the occurence of a late radiation reaction in a mucosa that would otherwise have received a dose well within the limit of tolerance."

In the Manchester technique, the radium ovoids are introduced while the patient is in the knee - chest position and then she is nursed on her back, a procedure which may be responsible for the change of position of the ovoids.

Following the introduction of the ovoids, the vagina is tightly packed with gauze to prevent them from slipping. This gauze is the cause of the offensive-smelling leucorrheoa.

The rubber ovoids are used only once and then are discarded due to the offensive smell they acquire. Also their rubber is radiopaque.

The gauze packing presses on the urethra causing retention of urine, which distends the bladder which pushes the uterus backwards and this explains the high dose to the anterior rectal wall in such cases. Some radiotherapists using the Manchester ovoids fix a catheter during radium treatment to prevent urine retention after tightly packing the vagina.

Daily douching is needed with change of the pack under general anesthesia.

In addition the ovoids may slip and cause severe rectal reaction.

CONCLUSIONS

The present vaginal applicator while keeping the advantages of the Manchester ovoids 1. simplifies physical calculations, 2. does not cause retention of urine, 3. needs no pack of vagina, 4. no slipping of ovoids, 5. no daily ansthetic but simply vaginal douche while it is in situ, 6. no offensive leuccorrhoea, and 7. delivers the predetrmined dose to the pelvic lymph nodes. 8. Sterilsation is done by immersing it in boiling water for 1 minute. 9. Protection is much better as radium is sealed inside it and no change as Manchester ovoids is needed each time it is used.

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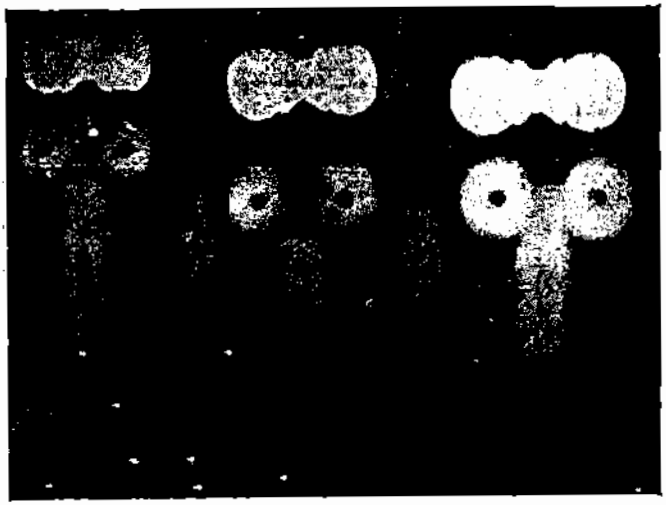

Fig. 1. Vaginal Applicator with Manchester ovoids for comparison.

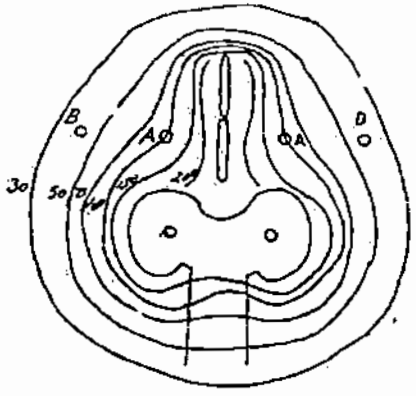

Fig. 2. Isodose Curves of Applicator

Fig. 3. Radiograph of Applicator with Radium A.P. view

Fig. 4. Lateral view

Fig. 1. Bladder empty «Corrugated balloon appearacne

Fig. 2. Bladder half full with 100 ccs saline

Fig. 3. Bladder full with 200 ccs saline

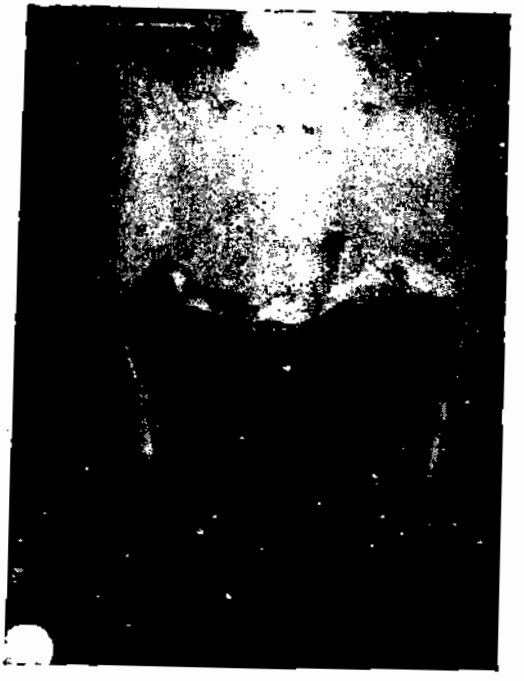

Fig. 4. Bladder full.

Fig. 5. Bladder Empty.

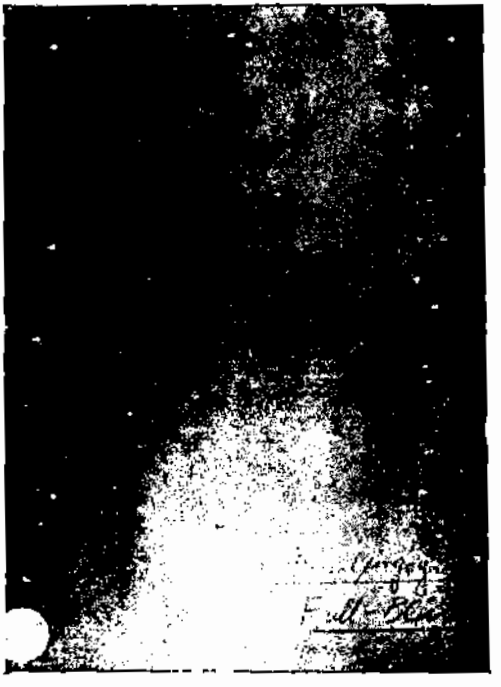

Fig. 6. Bladder full.

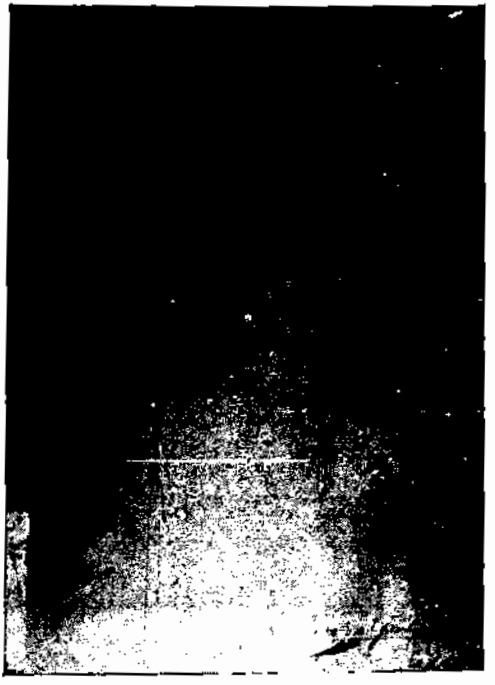

Fig. 7. Bladder Empty.

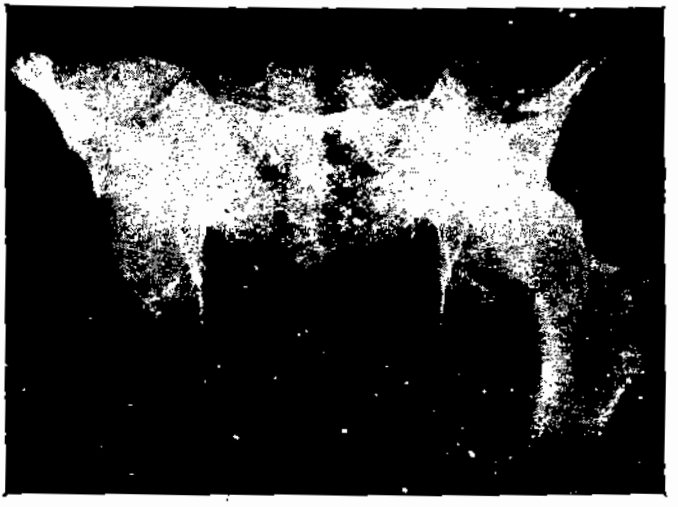

Fig. 8. Anatomical Phantom.