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LOW FREQUENCY VIBRATION DILATATION OF THE UTERINE CERVIX

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Carcinomas of the uterus are usually treated by a combination of intracavitary and external irradiation. Since 1969 the intracavitary treatment at this hospital has been given with an afterloading technique using ^{60}Co sources (a Cathetron). This technique has many advantages compared with radium treatment (e.g. O'CONNELL et coll. 1967), specially equipped rooms and anaesthetic staff not being required. The advantages of the technique may be summarized as follows: treatment times are short (minutes), only local analgesia is used, most patients are not hospitalized, only one doctor and two assistants are required, the treatment is individualized, exact localization of sources in the pelvis is obtained, and the staff is not exposed to radiation hazards.

The intrauterine irradiation is provided from sources introduced into a catheter inserted into the uterine cavity. As the catheter has a diameter of 6 mm the uterine cervix is normally dilated with Hegar dilators before the catheter can be inserted. This procedure usually causes pain and discomfort to the patient. Therefore, JOSLIN et coll. (1972) recommended general instead of local anaesthesia. When the uterine cervix is distorted by the tumour, dilatation with Hegar dilators can be difficult and sometimes impossible. Often, only a small diameter Hegar dilator can be introduced, and when this is removed it may be impossible to replace it with a larger one. There is always a great risk of the Hegar dilator perforating the wall of the uterus.

A technique for dilatation of the non-pregnant uterine cervix by low frequency vibrations is now reported as well as the preliminary experiences and the advantages to be gained by this method.

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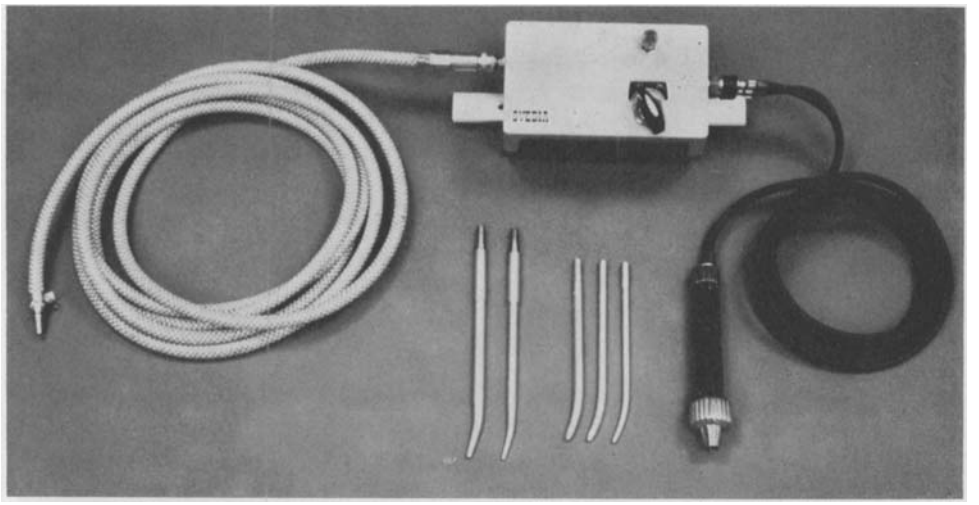

Svedia Cervix Dilator with two original and three modified dilators.

Material and Method

From 1 December 1977 to 30 April 1978 the vibration dilatation technique has been used as a routine on patients with gynaecologic carcinomas in order to dilate the cervix before the Cathetron catheter is introduced into the uterine cavity. During this period cervix dilatation was carried out on 49 patients, with totally 202 dilatations. The mean age of the patients was 61 years, the oldest being 84 and the youngest 37. Nine of the 49 patients were nullipara. Thirty-four patients with uterine carcinoma were given 160 vibration treatments, 8 with cervical carcinoma received 30 treatments, and 7 with ovarian carcinoma 12 vibration treatments. Patients with endometrial tumour were given 4 to 6 intrauterine Cathetron treatments, those with cervical carcinoma 3 to 5 intracavitary irradiations, and those with ovarian carcinomas received

Table 1

Diameter of cervical canal at commencement of vibration dilatations

	Diameter						Total No.
	<3 mm		3–4 mm		>4 mm		
	No.	Per cent	No.	Per cent	No.	Per cent	
At first dilatation	12	24.5	32	63.5	5	10.2	49
At repeat dilatations	28	18.3	106	69.3	19	12.4	153
At all dilatations	40	19.8	138	68.3	24	11.9	202

Table 2

Time required for vibration dilatation in seconds

	First treatment		Repeat treatments	
	Mean	SD	Mean	SD
Uterine carcinoma	90.2	37.8	69.1	26.7
Cervical carcinoma	145.0	64.1	97.3	45.2
Ovarian carcinoma	84.4	30.2	86.6	33.7
All cases	102.6	49.3	73.8	28.9

2 intrauterine irradiations. The number of intrauterine treatments thus ranged from 2 to 6. The intervals between the treatments varied from 1 to 7 days. On two occasions Hegar dilatation was performed erroneously instead of vibration dilatation.

All 49 patients had been examined 3 to 5 weeks before the treatment was started; a diagnostic curettage had been performed and the cervix dilated to a diameter of 8 mm by Hegar dilators. When the patients were transferred to oncology care a second gynaecologic examination was carried out using general anaesthesia. At this examination dilatation of the cervix was avoided so as not to disturb the planned vibration procedure, which began the following day.

Before each vibration procedure the diameter of the cervical canal was measured with Hegar dilators, and registered as the diameter of that dilator which could pass the canal without force or pain (Table 1).

A vibration generator (Svedia Cervix Dilator) driven by compressed air (90–420 kPa) was used. This has a control panel with a valve for regulating vibration frequency. The panel is connected by a tube to a handle containing an air-driven turbine and a vibration generator. The cervix dilator used is attached to the handle (Figure). The vibrations are produced by means of an eccentric disc positioned on the turbine axle. The tip of the dilator thus obtains a transverse, sinusoidal oscillation. The frequency used was 90 Hz and amplitude at the tip of the catheter was 0.5 mm. The diameters of the dilators were 8 mm at their largest part. The dilators have a transverse groove 5 cm from the tip. This prevents the operator from passing the dilator too for into the uterine cavity.

Dilatation of the cervix was carried out until the canal could be passed with a dilator without difficulty. This means that the canal was dilated to at least 8 mm. This was more than necessary as the diameter of the catheters is 6 mm, but was done in order to enable them to pass the cervix without resistance. Each vibration procedure was timed. Dilatation with the vibrators normally required about one to two minutes, the longer time being needed for patients with cervical carcinoma. As a rule the first dilatation required most time (Table 2).

An evident tendency of the cervix to retract after each vibration dilatation was observed, which was not experienced earlier when Hegar dilators were used.

Table 3

Results regarding premedication, local anaesthesia, patient reactions and insertion of the intracavitary catheter on 202 occasions

	Number	Per cent
Premedication (diazepam/pethidine)	46	22.8
Local anaesthesia (paracervical)	8	3.5
Discomfort		
None	121	59.9
Slight	73	36.1
Moderate	8	4.0
Severe	0	0
Pain		
None	159	78.7
Slight	39	19.3
Moderate	4	2.0
Severe	0	0
Catheter insertion		
No resistance	126	62.4
Slight resistance	69	34.2
Moderate resistance	2	1.0
Failure	5	2.5

All vibration dilatations were performed by one of the authors (B.S.). At each treatment the reactions of the patients were carefully observed and the patient was asked about pain or discomfort during the procedure. Difficulties in introducing the Cathetron catheter into the uterine cavity after the dilatation of the uterine cervix were also noted.

Results

A number of parameters were used to measure the effects of vibration dilatation of the cervix (Table 3). At 8 dilatations of 202 it was necessary to give local anaesthesia in order to complete the procedure One patient had local anaesthesia for 3 dilatations, 2 patients for 2 each, and one patient for one dilatation. Premedication (diazepam or pethidine) was used on 46 occasions. However, the need for premedication may have been caused by the nervousness of some patients in regard to the treatment and not because of the vibration procedure.

In most cases the patients had very little or no discomfort during dilatation (96 %). None found the dilatation very uncomfortable. During 98 per cent of the treatments no or only slight pain occurred and no patient had severe pain. Normally the treatment catheter was introduced without difficulty. Only 5 times was it impossible to pass the cervix, in one patient on 3 occasions and in another on 2. Both had carcinoma

of the uterine cervix. At these 5 attempts dilators of unsuitable shape were used and this factor may have caused the failures. After the tips of the catheters were modified to a more rounded form (Figure) no further failures occurred; the modified dilators seemed to follow the cervical canal of their own accord even when the canal was deformed and very little longitudinal pressure appeared to be required. In no case was the uterine wall perforated nor any appreciable bleeding or any false entrance to the uterine cavity made.

Discussion

Cervical dilatation with low frequency vibrations during pregnancy in connection with legal abortion and labour has been tested since 1964 (ZSARKIN & IVANOV). The technique has several advantages. It is simple, rapid and safe. General anaesthesia is not necessary. The risk of perforating the uterus is small (CSAKI 1967), and also of producing irreversible damage of the cervical tissues (TOKUYAMA & FUJIMOTO 1966, LJUNG & SIVERTSSON 1972). This agrees with the observations that the cervical canal seems to retract quicker after vibration dilatation than after Hegar dilatation, thus suggesting less tissue injury. Vibration dilatation shortens the labour, especially during the period of cervical dilatation (DAHLGREN 1976). The uterine cervix is composed of fibrous connective tissue and to a lesser extent of smooth muscle (DANFORTH 1954). Experimentally, it has been shown that low frequency vibrations effectively reduce the contractile force and tension of smooth muscle and that the effect is immediate and reversible (LJUNG & SIVERTSSON). The effect on fibrous connective tissue is largely unknown.

Clinical and experimental reports on the effect of vibrations on the non-pregnant uterine cervix are sparse. BLACK et coll. (1975) have shown the advantages of vibration dilatation compared to conventional Hegar dilatation on non-pregnant surgical uterus specimens.

Uterine perforation is a serious complication in connection with intracavitary irradiation. The delivered dose at the Cathetron catheter surface may reach 100 Gy per irradiation. If a catheter is too close to the intestine such a high dose may easily cause severe damage. As the dilatation could be carried out with only slight longitudinal pressure on the vibration catheter the risk of perforation is small. Further, most of the patients had little or no discomfort or pain, and therefore as a rule sedatives or local anaesthesia were not required. Thus the method is specially suitable for out-patient treatment.

Local anaesthesia in connection with Hegar dilatation is carried out by paracervical block. The anaesthetic solution is injected into the tissues close to the uterine cervix. This procedure may temporarily compromise the blood circulation to the tumour, which becomes hypoxic. As this decreases its radiation sensitivity local infiltration with anaesthetic close to the tumour should be avoided.

Individual patients may have their cervix deformed by the tumour, making a dilatation of the cervix by Hegar dilators difficult or impossible. In such cases it may be

possible to dilate the cervix successfully by the vibration method, allowing an accomplishment of the irradiation.

Tumour cells may be set free by the vibrations and disseminated during the treatments. This risk is considered less than with Hegar dilatation as the vibration method appears to produce less tissue damage. However, no reports on cell dissemination by the vibration method have appeared.

The preliminary results appear promising. Intracavitary irradiation of gynaecologic carcinomas with the afterloading technique is simplified by the vibration method, and the treatment is made easier both for the patient and for the staff.

SUMMARY

Dilatation of the uterine cervix by low frequency vibrations has been carried out before intra-uterine irradiation with ^{60}Co by the afterloading technique. No complications or technical difficulties occurred. The method seems to be easy, safe, rapid and usually without unacceptable discomfort to the patient. The need for sedatives or general or local anaesthesia was reduced.

ZUSAMMENFASSUNG

Die Dilatation der Cervix uteri wurde durch Vibrationen mit niedriger Freqeuenz vor intrauteriner Bestrahlung durch ^{60}Co mit der Nachladetechnik ausgefürht. Keine Komplikationen oder technische Schwierigkeiten traten auf. Die Methode scheint einfach, sicher, schnell und im allgemein ohne nicht akzeptierte Unbehaglichkeit für die Patienten zu sein. Die Notwendigkeit für Sedative oder generelle oder lokale Anästhesie wurde vermindert.

RÉSUMÉ

Une dilatation du col utérin par des vibrations de basse fréquence a été effectuée avant l'irradiation intra utérine par le ^{60}Co par la technique d'afterloading. Il n'y a pas eu de complication ni de difficulté technique. Cette méthode paraît être facile, sans danger, rapide et habituellement sans désagrément inacceptable pour les malades. Cette méthode permet de réduire l'utilisation de sédatifs ou d'anesthésie générale ou locale.

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