

CRYOSURGERY IN GYNAECOLOGY

by

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Cryosurgery in Gynaecology

The word cryo is derived from the Greek word 'Kryos' which means icy cold. Cryotherapy is the therapeutic use of cold. Cold has been used for medical purposes as early as 2500 B.C. In 1930, Lortat Jacobs used solid carbon-dioxide and acetone for treating erosions of the cervix with good results. Smith and Fay (1939) used local and general cryotherapy in patients with untreatable cancer for relief of pain. This was found to be more effective than chordotomy and narcotics. Weitzner (1940) reported a 70% cure for endocervicitis with carbon-dioxide snow.

Cryosurgery is a modality of therapy that causes controlled destruction of tissues by subjection to sub-freezing temperatures. As a surgical agent, cold has the advantage of an anaesthetic and coagulant besides its destructive properties. The extent of its action is predictable and controllable. The edge of a frozen lesion is sharply delineated from the adjacent tissue and creates complete haemostasis.

Cryosurgery has been applied to many fields in medicine ranging from cataract to prostatectomy and neurosurgery. Com-

paratively it is a new innovation in gynaecology. Major portion of the female genital tract can be easily instrumented. Hence, cryosurgery can be used in diseases of the vulva, vagina, cervix and endometrium. It has been tried for the transuterine freezing of the isthmus of the fallopian tube, to destroy elements of ovarian carcinoma not resectable at the time of primary operation and to aid in the dissection of pelvic masses by solidifying the liquid elements of the mass. Its use in benign diseases of the cervix is well established. Its application in the treatment of cervical dysplasia and early cervical malignancy is still under trial. In 1970, Crisp *et al* tried Cryosurgery in patients with abnormal cervical smears ranging from dysplasia to carcinoma in situ, who wished to retain uterine function. Follow-up studies in these patients have shown normal cervical cytology and excised surgical specimens 4-6 weeks later have shown no evidence of carcinoma. Cryosurgery has been used in the palliation of cervical neoplasms resistant to other lines of treatment and to control profuse haemorrhage in carcinoma of the cervix where it may replace the need for internal iliac artery ligation.

Cryosurgical methods could provide a simple reliable and safe means of producing destruction of the endometrial lining of the uterus with consequent organ failure. Thus it can be used in the treat-

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ment of abnormal uterine bleeding and for conception control. The thick vascular myometrial wall acts as a natural barrier to the progression of cold to the nearby vital organs like bladder or rectum. On the vulva and vagina it can be used for the cauterisation of warts and granulation tissue.

The use of cryosurgery in the treatment of benign cervical erosions and endocervicitis consists in destroying the eroded area so that it can be covered over by healthy epithelium. Electrocauterisation has been widely employed in its treatment but is attended with the dangers of heavy bleeding and cervical stenosis—none of which are encountered with cryosurgery.

Cryosurgery relies for its value on local tissue changes produced by rapidly achieved profoundly low temperature. Ice crystals form in the intracellular and extracellular spaces. Intracellular crystals damage the tissue by expansion and rupture of the cell membrane while the extracellular ice crystals damage the tissue by compression. A combination of their physical action together with temperature and the morphological and chemical changes effected by vascular stasis leads to cellular destruction. Necrosis caused by cold is called cryonecrosis.

When the Cryostat is activated the tissue to which it is applied begins to freeze. It becomes white and of the consistency of ice—called the 'ice-ball'. The thawing should be allowed to proceed spontaneously and considered complete when the frozen tissue has regained its original colour, shape and consistency. Best method of obtaining maximum tissue destruction is to freeze an area slightly larger than the lesion as rapidly as possible and allow the tissue to thaw slowly. Cryosurgical equipment supplies the for-

mer and normal body temperature supplies the latter.

Subjecting tissues to subfreezing temperatures leads to a rapid development of intracapillary thrombosis and lymphatic and vascular obstruction with minimum blood loss. Rapid destruction of free sensory nerve endings makes cryosurgery painless and area of cryonecrosis pain-free.

Pathological Changes in The Cervix Following Cryosurgery: Macroscopic Changes

Cervix thaws within 20 minutes of treatment. At 24 hours, an opaque membrane forms over the treated area which is raised and sharply demarcated from the surrounding tissue. On its removal the underlying tissue appears granular and hyperaemic and bleeds easily on touch. Seven days following freezing the circumferential part of the cervix appears hyperaemic and slightly oedematous and is clearly demarcated from the necrotic centre. In the second week the cervical os becomes identifiable. The necrotic mass disappears leaving a red to pale pink area. Cervical tissue slowly begins to regenerate. At 6 weeks, the cervix is almost healed. Few cervixes may show scattered pin-point erythematous areas. At 8 weeks, the cervix resembles a nulliparous cervix. It does not bleed on touch, there is no scarring and no cervical stenosis.

Microscopic Changes

Immediately after freezing there is a sharp line of demarcation only a few cells in width, separating the normal from the cryocauterised tissue. The treated area contains cells with pyknotic nuclei. This is followed by vasocongestion, leukocytic and lymphocytic infiltration, vascular endothelial sloughing and oedema. At

24 hours, the cervix shows acute inflammatory changes. Blood vessels show hyalinisation with endothelial sloughing. Vessel walls are thickened with sludging of cells and partial obliteration of lumen. Stroma is acellular with condensation of collagenous components.

Two weeks from the time of freezing the blood vessels have regained their endothelial lining. Hyalinisation of the vessel walls persists for at least 4 months and is characteristic of a cryocauterised cervix. There is a considerable amount of surrounding stromal inflammation. The inflammatory response slowly subsides and disappears by the fourth week. At four weeks the stroma contains dilated vessels, granulation tissue and regenerating surface epithelium. From four to eight weeks, the epithelium shows basal cell hyperactivity. Healing progresses to the eighth week when normal stroma and epithelium are present. Cervix is completely re-epithelialised by squamous epithelium. The squamo-columnar junction is found deeper within the cervical canal.

Equipment for Cryosurgery

Photograph 1 shows the various components of cryostat. We have used the KRY Med MT-500 Multi Tip Cryosurgical Probe which functions with carbon-dioxide or nitrous-oxide gases. It consists of an insulated cylinder for liquid gas, a yoke which fits to the outlet of a medical post valve gauge for pressure record and insulated gas supply hose carrying gas under pressure to the probe. Probe tips are non-insulated. The liquid gas passes to the tip where it withdraws heat from adjacent tissues thereby being rapidly transformed into gas. Inter-changeable tips are available for use in different types of lesions. Flat tip for use on vaginal aspect of the cervix. Exo/Endo Cervical

tips which have superficial as well as endocervical freezing capability, straight probe tip for endocervical freezing alone, and microtip to freeze granulation tissue and warts.

Material and Methods

A total of 200 patients amenable to Cryosurgical therapy were randomly selected from the Gynaecological Out-Patient Department of K. E. M. Hospital from November 1973 to June 1975. Before treatment, a detailed history was taken, a per speculum examination made to determine the type and extent of the lesion and a vaginal examination performed to exclude pelvic pathology.

In all patients high vaginal and cervical smears were taken for cytological study. Patients having dysplasia were excluded from the series. A cervical biopsy was taken in some cases.

Patients were called for Cryosurgery soon after the menstrual period to avoid treatment during pregnancy and to give the cervix sufficient time to heal before the next period. Cryosurgery was done as an outpatient procedure. No patient was admitted to the hospital. All were ambulatory and were sent home immediately after the procedure.

None of the patients received any anaesthesia or analgesia. Carbon-dioxide was used as refrigerant in the first 50 cases and nitrous oxide in the rest for no particular reason except easy availability. A suitable probe tip was selected. Duration of the treatment was timed and the number of applications required to cover the whole extent of the erosion were noted. Complications like pain, discomfort or bleeding during the procedure or immediately following it were noted. They were asked to avoid intercourse for four weeks. One hundred and five pati-

ents were followed up after 8-12 weeks of treatment when systematic or local complaints were noted. Cervical healing was assessed and cytological examination repeated. The cervical canal was probed to exclude cervical stenosis. Those patients who had a persistent erosion were given a repeat treatment.

Procedure

Patient was put in lithotomy position. Vaginal toilet was performed. Sim's speculum was introduced and anterior lip of cervix held with a volsellum. The type and size of the cervical lesion noted and a suitable probe tip selected. The probe at room temperature was placed against the lesion and the cryostat activated. Care was taken to avoid contact of the probe with the vagina or vulva as it results in first degree burns. The cervical tissue became white and of the consistency of ice forming the characteristic ice ball (Photograph 2). The tip of the probe became firmly adherent to the tissue. Freezing was continued for 3 minutes. After freezing was discontinued, the probe was held in place till sufficient thawing had occurred to permit its easy removal. No attempt was made to pull it out from the tissue while it was still adherent to it.

Presenting Symptoms

Table I shows the presenting complaints of patients undergoing cryosurgery. Vast majority of them (104) had come with leucorrhoea as chief complaint. Leucorrhoea was associated with other complaints in 64 patients. Asymptomatic erosion was not subjected to Cryosurgery.

Type of Lesion

The findings on speculum examination are tabulated in Table II. Eighty-four

TABLE I
Presenting Symptoms

Symptoms	Number of Patients
Leucorrhoea	104
Leucorrhoea + backache	32
Leucorrhoea + Sterility	9
Leucorrhoea + pain in Abdomen	14
Leucorrhoea + pruritus vulva	6
Leucorrhoea + burning micturition	3
Sterility	5
Dyspareunia	4
Backache	9
Bleeding per Vaginam	1
Irregular menstruation	10
Dysmenorrhoea	3
Total	200

TABLE II
Type of Lesion

Type of Lesion	Number of Patients
Cervical erosion	84
Endocervicitis	16
Cervical erosion + endocervicitis	85
Endocervical polyp	7
Granulation tissue	8
Total	200

patients had an erosion on one or both lips of the cervix. In 85 cases the erosion was associated with endocervicitis. Sixteen patients had endocervicitis alone while 7 of them had endocervical polyp. Eight patients had granulation tissue at the vault following a vaginal hysterectomy.

Type of Pelvic Pathology

A routine vaginal examination was performed in all the patients. Results are shown in Table III. Majority of them had

TABLE III
Type of Pelvic Pathology

Pelvic Pathology	Number of Patients
Normal findings	186
Bulky uterus	3
Small uterus	7
Thickening in the fornices	1
Cystic ovaries	3
Total	200

34 patients in whom the erosion looked suspicious. The report was negative for carcinoma in 14 and the remaining 20 showed an inflammatory reaction.

Follow-Up and Results

Symptoms Following Cryosurgery

Seventy-four of these patients had complained of leucorrhoea prior to Cryosurgery. Table IV shows that there was no

TABLE IV
Symptoms Before and After Cryosurgery

Complaints	Before	A F T E R		
		Absent	Reduced	Persistent
Leucorrhoea	74	62	9	3
Leucorrhoea + backache	17	10	3	4
Leucorrhoea + pruritus vulva	1	1	-	-
Leucorrhoea + pain in abdomen	5	4	1	-
Backache	3	1	1	1
Sterility	2	-	-	2
Irregular periods	3	-	-	3
Total	105	78	14	13

normal findings. Three patients were pregnant at the time of cryosurgery. Burke and Rubin (1968) have performed cryosurgery in pregnant patients with no complications. Pregnancy does not contraindicate cryosurgery as it causes no scarring of the cervix which interferes with dilatation during labour.

Cytology and Cervical Biopsy

A high vaginal and cervical swab was taken in all the patients prior to cryosurgery, and stained by Papanicolaou's method. One hundred and fourteen patients showed normal cells on cytology and the remaining 86 showed inflammatory reaction. Patients having dysplasia of any grade were not included in this study. A cervical biopsy was required in

discharge in 62 patients, it was significantly reduced in 9 patients and persisted in 3 of them. Thus a decrease of vaginal discharge was seen in 91.2% cases. This was closely related to the effectiveness of cryosurgery in healing the abnormal area. Townsend *et al* similarly noted a decrease of vaginal discharge in 90% of their patients.

Backache with or without leucorrhoea was present in 20 prior to cryosurgery. Eleven of them were completely relieved and it was much less in 4 patients, i.e. 75% noted an improvement or cure. In Jackson's (1972) series, backache was present in 24% of cases before treatment. It persisted in 14% after treatment. There was no change in menstrual cycles following cryosurgery.

Healing of The Cervix following Cryosurgery

Table V shows cervical healing follow-

TABLE V
Cervical Healing Following Cryosurgery

Site	Healed	Not Healed
Cervix	87	13
Vault	4	1
Total:	91	14

ing eight to 12 weeks of treatment. Of the 105 patients seen at follow-up, 91 were completely healed and 14 had failed to do so. Thus it was successful in 86.6% of cases. Ten of these patients with a persistent erosion were given a repeat treatment. Six of them were followed up after 8 weeks. Five of them showed good healing while erosion persisted in the remaining 1 though there was a considerable improvement. Photograph 3 shows a healed cervix eight weeks following cryosurgery. Presence of Trichomonal vaginitis invariably gave failure as in all 7 with infection.

Ostergard (1968) reported that healing was complete in 74% cases within 8 weeks and 15% healed later. Only 11% patients showed incomplete healing but there was significant improvement in each case. These patients were later shown to be incompletely treated.

Townsend *et al* (1971) reported that 85% cervixes healed at eight weeks, 13% required two treatments while 3 treatments were required in 2% of cases.

Sounding The Cervix

The sound was passed into the cervical canal to confirm its patency. All of them were found to be patent. No patient had cervical stenosis.

Cytology

A 'Pap Smear' was repeated in all the 105 patients who came for follow-up. The report was negative in all the 91 cases who showed good healing. Of the remaining 14, 6 had negative cytology, while the other 8 showed a persistence of inflammatory cells. There was a marked improvement of cytology finding following cryosurgical treatment of chronic cervicitis.

Complications at The Time of Procedure

Pain

Thirty-five patients complained of discomfort to slight pain in the lower abdomen or pelvis during the procedure and five patients had moderate pain (Table VI). In no case was it necessary to stop

TABLE VI
Complications

During Procedure	Number of Patients
Discomfort to slight pain	35
Moderate pain	5
Bleeding	2
Total	42

After Procedure	Number of Patients
Vaginal Discharge	70
Vaginal Bleeding	9
Post Coital Bleeding	6
Systemic Complaints	-
Total	85

the procedure or give anaesthetics. Few patients who complained of post-operative pain were given mild analgesics.

TABLE VII
Comparative Aspects.

	El. Cautery	Cryo-Coutery
Simplicity	Yes	Sophisticated
Safety	—	Safer
Uniformity	—	More
Extent and Depth	—	More Predictable
Haemostatic	Mild	Powerful
Coagulant	—	Better
Effect on Blood Vessels & Lymphatics	—	Seals
Anaesthetic	No	Yes
Major Complications	Can occur	Rare
I.U.C.D.	Can't	Can
Availability of Gas	Not reqd.	Not easy
Cost	Cheap	Exorbitant

Vaginal Bleeding

Two patients had bleeding immediately following cryosurgery. Both had a cervical biopsy prior to cryosurgery for a suspicious erosion. They were immediately given a second treatment after which the bleeding stopped.

Complication After Cryosurgery Vaginal Discharge

This was most frequent and annoying complication in 70 of the 105 patients (66.6%). They complained of a variable amount of discharge beginning at 24 hours and lasting for 7 to 21 days.

The discharge was at first clear serous fluid which gradually became more mucoid and diminished in amount. All with healed cervix after treatment were free of discharge and most of the others showed a substantial improvement.

Vaginal Bleeding

This was present in the form of blood stained discharge or minor spotting in 9 (8.5%) patients, while 6 (5.6%) complained of minimal post coital bleeding. These patients had intercourse in the first few weeks despite of being warned against it. No patient had severe bleeding

or required admission to hospital. Ostergard *et al* (1969) report minor spotting in 50% of patients and post-coital bleeding in 25% of them. Townsend (1971) also reported spotting in 50% of patients. None of the patients had any systemic manifestations like weakness, dizziness or flushing.

Discussion

A review of literature shows that major complications have been reported infrequently with cryosurgery. Our present series confirms the fact. Most frequent complication recorded is a profuse vaginal discharge. Paloucek *et al* (1968) reported only 2 cases of severe bleeding in 250 patients. No major bleeding or other complications have been reported in many of the articles published by Ostergard *et al* (1968, 1969) and Townsend *et al* (1971). Main sequela of electrical methods are bleeding, infection and cicatrization. Cold is an excellent haemostat, hence post-operative bleeding does not occur. No instance of cervical stenosis occurred in this series and only one has been recorded in literature by Paloucek (1968). Cryosurgery is found to have no effect on conception, pregnancy and labour.

Cryosurgery has been found to be acceptable to the patient. Only a few patients complained of mild discomfort in the lower abdomen. It causes a rapid destruction of the free sensory nerve endings making cryosurgery painless. Ostergard (1968) reported severe discomfort in 67% of the patients following electro-cauterisation and an unpleasant sensation because of heat generated in the vagina. Mild to severe uterine cramps occurred in 28%, whereas following cryocauterisation 38% patients experience no discomfort and only 20% had uterine cramps slightly greater than those associated with menses. Aesthetic advantage of cryocauterisation is the lack of smoke and absence of pungent aroma.

Cryosurgery can be done with I.U.D. in place, as freezing does not affect the plastic tails which would be destroyed by electro-cautery. It can be easily performed in the out-patient department without anaesthesia, thus obviating the need for admission to hospital.

Among the few disadvantages are the cost of the equipment and the refrigerant. It destroys the opportunity to examine the pathological tissue.

Certain precautions should be observed in using this treatment. It should be performed soon after menstruation to allow time for some healing before the next period. Patients should avoid intercourse for at least 2 weeks afterwards. Patients should not use intravaginal tampons and no douching should be allowed as they might provoke bleeding. It should not be performed on a patient who has an abnormal cervix smear—Class III or worse or a cervical biopsy which discloses dysplasia or worse. These patients must undergo additional examination to rule out the presence of cervical malignancy.

Conclusion

This study shows that Cryosurgery is an effective and safe treatment for benign diseases of the cervix like cervical erosions, endocervicitis, endocervical polyps, and granulation tissue at vaginal vault. 86.6% of the patients healed after a single treatment with Cryosurgery. It caused minimal discomfort to patients. No major complications were encountered. Presence of Trichomonal vaginitis caused failure of therapy.

Summary

1. Series of 200 patients with various Gynaecological complaints and findings were subjected to Cryosurgery—a new modality for these lesions.
2. The commonest complications were Leucorrhoea in 104 and Leucorrhoea with other complaints in 64 patients.
3. Cervical erosion and Endo-cervicitis were commonest indications for use of Cryosurgery.
4. Healing rate was 86.6% for cervical erosions and endocervicitis.
5. Complications were of minor nature and caused no problem.
6. Instrument, patho-physiology and various other aspects are discussed at length.

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See Figs. on Art Paper I