ONE YEAR'S EXPERIENCE OF CRYO-CAUTERIZATION WITH INDEGENOUSLY DEVELOPED CRYO-PROBE

by

NIKHILESH G. SHAH
(MISS) VILASBEN M. MEHTA
and
GIRISHCHANDRA H. SHAH

SUMMARY

Cryo-probe suitable for Gynaecological (as well as Surgical) applications was developed from locally available copper tubings and capillaries, normally used in household Refrigerators and Air-Conditioners. Relevent design aspect of the indegenously developed Cryoprobe alongwith comparative data of properties of different Refrigerant Gases have been discussed in addition to the results of Clinical Trial of developed Cryo-probe for Cryo-cauterization of cervical erosion, for the last one year.

Though in Cryophysics, only temperatures below –150°C are considered, in Cryosurgery, for therapeutic purpose, temperatures below –20°C are taken into account, as it can effectively produce cell-death.

Most of the Cryoprobes work on Joule-Thompson Effect, i.e. when the gas under high pressure is released through a small opening (orifice), the energy required for the expansion of the gas is taken away from the surroundings, resulting into low temperature. This principle was utilized to design a cheap and dependable Cryo-Probe working on commonly available liquid gases like Carbon Dioxide, Nitrous Oxide and Freon.

From: Sheth L. G. Hospital's Referral Unit Behrampura, Ahmedabad, Sheth Vadilal Sarabhai Hospital, Ellisbridge, Ahmedabad, and B.J. Medical College and Civil Hospital, Ahmedabad.

Accepted for publication on 13-3-84.

The Probe was prepared from copper tubing and capillaries used in household refrigerators and air-conditioners. Simple polythelene pipes were used for insulation purpose, as Teflon coating was costly on small scale.

As shown in the cross-sectional diagram, (Fig. 1) the capillary is started right from the beginning and is covered with double layered plastic tubing which constructs the return regeneration path of the gas, which is released at the tip of the interchangable Probe-tip.

The control-box is an accesory, which can be inserted between the Cryo-probe and the cylinder, as shown in Fig. 2. It has got gas pressure gauge and on-off control valve which controls release of the gas.

Five different types of Probe-tips were developed (Fig. 3). Palleted tips are useful for nulli and multiparous cervices, flat cylindrical tip is useful for big flat

lesions (like erosion on either lip of cervix, big warts, haemengioma etc.), while long pointed tip is useful for cauterization of small wart like lesions.

The Cryoprobe can be directly fixed to the cylinder and used independently i.e. without the control-box. The cylinder on-off valve regulates the flow of gas.

Table I shows the comparative data of all the different refrigerant gases used for Cryosurgery. Carbon Dioxide is the cheapest gas which gives the probe temperature of –65°C. But it has to be carefully handled because of the high pressure, i.e. 1028 lb/sq. inch. Freon-22, (gas used in Air-conditioner machine) though costly, has got the greatest advantage of easy availability from city refrigerator repair shops and the small size of the cylinder due to less pressure, i.e. 159.8 lb/sq. in.

The probe developed was tested by Cryocauterization of benign cervical lesions in 158 patients during the last year (Figs. 4 and 5). The benign nature the erosion was confirmed by Pap smear only as Colposcope was not available. All the patients were followed up monthly for 3 months. One hundred and forty-three patients were completely cured, i.e. they had no residual erosion after 3 months (Table II).

TABLE II

Cure Rate

Follow-up	No. of patients cured	Total	Percentage
1 month	12	12	7.6
2 month	89	101	63.9
3 month	42	143	90.5

The only disadvantage is the excessive vaginal discharge, which lasts for 7 to 10 days. This is not a problem, if the patients are explained beforehand about the sequelae.

TABLE I

Comparison of Different Refrigerant Gases

	Carbon Dioxide	Nitrous Oxide	Freon 12	Freon 22	Liquid Nitrogen
1. Lowest temp. achieved at probe-tip	—65°C	—78°C	—20°C	—40°C	—196°C
2. Boiling point of liquid gas	—85°C	—89°C	—29.4°C	—41.4°C	—196°C
3. Cylinder gas pressure (lb/sq. inch)	1028	760	93.3	159.8	1 atm.
4. Probe design	Easy and economical	same	same	same	difficult and costly
5. Approximate Price of 1 Kg. gas	Rs. 9	Rs. 25	Rs. 50	Rs. 80	Rs. 6 (litre)
6. Price of cylinder	Rs. 800-1000	same	Rs. 100		Rs. 5000
7. Storage of gas	Indefinite unless the cylinder is leaking	same	same	same	evaporates in few days

Thus, in conclusion, Cryosurgery has an edge over conventional cautery, with regards to its painlessness and higher and better cure-rate. The development of the indegenous Cryoprobe has nullified the cost factor existing between the Heat cautery and Cryosurgical Instrument. (The raw material cost of Cryoprobe alone is Rs. 100/- and that of Control-box Rs. 200/-).

Total 165 patients were cryocauterized, out of which 158 patients turned up for follow-up till 3 months or more.

See Figs. on Art Paper V, VI