EXPERIMENTAL STUDY

Role of Swedana Therapy against a transplantable mouse tumour – An Experimental Study

Dr.K.J.Malagi, Dr.M.S.Kamath*, Dr.B.S.S.Rao**, Dr.P.Uma Devi***

Abstract :

The validity of hyperthermia was known in India since the vedic times Swedana (Sudation Therapy) has been practiced extensively for different types of diseases. The beneficial effect of hyperthermia in the treatment of cancer was reported as far back as the time of Hipocrates about 400 B.C. Hyperthermia in the tempeprature range of 41°C to 45°C has been known to show tumouricidal effect both in experimental and clinical studies. The present experimental study was aimed to study the effect of Swedana Therapy against a transplantable mouse tumour B16F1 melanoma. Swedana treatment was given locally for 2 and 4 minutes and tumour regression was observed. Both the treatment groups showed more than 65% complete response (CR) without any systemic toxicity.

In view of the present experimental findings it is very clear that localized Swedana therapy in a temperature range of 60°C to 70°C for period of 2 to 4 minutes is sufficient for the elimination of localized mouse solid tumour. However the potential effect of Swedana therapy has to be tested against several tumour models in experimental animals before embarking any clinical studies.

Keywords : Swedana, hyperthermia, melanoma, cancer, transplantable mouse tumour

सारांश

भारत में स्वेदन की वैधता वैदिक काल से ही ज्ञात थी। विभिन्न विकारों में स्वेदन कर्म बहुतायत में प्रयुक्त होता रहा है। कैन्सर में स्वेदन कर्म के उपशयात्मक प्रभाव का उल्लेख ४०० ई.पू. में हिप्पोक्रेटस काल में भी मिलता है। प्रयोगशालीय एवं चिकित्सकीय परीक्षणों में ४१°C से ४५°C तक के ताप का अर्बुदहर पर स्वेदन कर्म प्रभाव का अध्ययन किया गया है। २ एवं ४ मिनिट के स्थानीय स्वेदन का अर्बुदहर प्रभाव देखा गया। दोनों वर्गों में ६५ प्रतिशत से अधिक संपूर्ण उपशय बिना किसी विषाक्तता के पाया गया।

प्रस्तुत प्रयोगशालीय परीक्षणों के आधार पर यह स्पष्ट है कि ६०°C से ७०°C के तापमान का २ से ४ मिनिट तक का स्थानीय स्वेदन, स्थानीय अर्बुद को नष्ट कर देता है। तथापि स्वेदन कर्म का परीक्षण अन्य प्राणी अर्बुद मॉडल्स पर करने के उपरान्त ही चिकित्सकीय अध्ययन किया जाना चाहिये।

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The beneficial effect of hyperthermia in the treatment of cancer was reported as far back as the time of Hippocrates about 400 B.C. Description about the treatment of a breast tumor with heat was quoted in the "Edwin Smith Surgical Papyrus" in the Egyptian papyrus roll (Breasted 1930, Overgaard 1985). It is in words of the Hippocrates.

"Quae medicamenta non sanant ferrum sanant Quae ferrum non sanat, ignis sanat Quae vero ignis non sanat insanobilia reprotari oportet"

"Those illness which are not cured by drugs will be cured by knife. Those which are not cured by knife will be cured by fire. Those which are not even cured by fire will be incurable."

The validity of hyperthermia was known in India since the vedic times (600 – 200 B.C.). Swedana (Sudation therapy) has been practiced extensively for different types of diseases (Charaka Samhita, 1949). Spontaneous tumour regression following infectious diseases resulting in high fever has been reported during last century (Busch 1866, Bruns 1998). These encouraging results prompted a number of investigators to induce fever with pyrogenic bacteria aiming tumour cure (Coley, 1893, 1896).

The present experiment was aimed to study the effect of swedana therapy against a transplantable mouse tumour.

MATERIALS AND METHOD:

TUMOUR MODEL:

The mouse solid tumour B16F1 melanoma was obtained from the Cancer Research Institute, Bombay, India, and propagated by serial transplantation into the dorsal skin of adult inbred C57 mice in the Dept. of Radiobiology, K.M.C., Manipal. Solid tumours were produced by injecting 5 x 105 viable cells intradermally on the dorsal skin. The tumour growth diameter in the three perpendicular planes (D1, D2, D3) was measured thrice a week and the tumour volume was calculated from the formula V = /6 (D1, D2, D3). Once the tumour reached 100mm3 animals were used for experimental studies. Tumour bearing animals were anaesthetized with Ketamine (50 mg/Kg body wt.) and diazepam (0.5mg/mouse) injected intraperitonially. Animals were restrained in a well ventilated perspects boxes with a slit through which only the tumour was drawn out.

SWEDANA THERAPY:

Tumours were subjected to swedana therapy through the rubber tube attached to a pressure cooker, at a distance of 4 inches for a period of 2 and 4 minutes in 4 perpendiuclar directions.

Both rectal and tumour core temperatures were monitered using microprobes (0.33 mm diameter, 10 mm long physitemp U.S.A.), attached to a digital thermometer.

EXPERIMENTAL DESIGN:

Tumour (100 + 100 mm3) bearing animals were divided into following groups:

Control (untreated)

Swedana Therapy for 2 minutes

Swedana Therapy for 4 minutes

Each experimental group had a minimum of 6 animals.

PARAMETERS STUDIED:

TUMOUR RESPONSE:

After swedana therapy tumour response was assessed on the basis of tumour regression : Complete response (CR) i.e. compite regression with no regrowth during the 50 days of observation: Partial response (PR) a regression to 50% or more of the treatment size or no

response (NR), less than 50% regression in the treatment volume (Uma Devi and Rao, 1993).

RESULTS AND DISCUSSION:

The mouse from tumour B16F1 melanoma grown in our inbred C57 mouse colony did not show any spontaneous regression confirming the non immunogenic nature of the tumour model. Immediately after swedana therapy the rectal temperature was raised to 37.84°C. to 35.11°C. However the body temperature was brought back to normal by 5 to 10 minutes of post treatment. Similarly, tumour core temperature increased from 32.96°C to 58.6°C immediately after treatment, which was brought back to normal only after 15 to 20 minutes after treatment.

All the tumours in both the treatment groups (2 minutes or 4 minutes of swedana therapy) started shrinking after 24 hours post treatment. The tumours became blackened and necrotic. Swedana Therapy for 4 minutes showed 89% CR and 2 minutes treatment showed 66% CR. In both the groups, animals were observed for 50 days of post treatment during which there was no sign of tumour regrowth in the treatment site. In those animals where treatment regressed completely, among the treated groups 4 minutes swedana therapy showed a better tumour response in comparison with that of 2 minutes treatment. The health conditions of the treated animals was equally good as that of the control animals.

Hyperthermia in the temperature range of 41°C to 45° C has been known to show tumericidal effect both in experimental and clinical studies (Pettigrew et al, 1974, Uma Devi and Rao, 1993, Rao and Uma Devi 1996). In view of the above experiment it is very clear that localized swedana therapy in a temerature range of 60 to 70°C for a period of 2 to 4 minutes is sufficient for the elimination of localized mouse solid tumour. However more extensive experimental studies have to be carried out against a spectrum of tumour models before recommending swedana therapy for extending its potential for the treatment of localized solid tumour in cancer patients.

TABLE: Regression of B16F Mouse Melanoma after SWEDANA THERAPY

Treatment	No. of animals	% of Tumour Response CR	PR	NR
Control (Untreated)	10	0.00 (0/10)	0.00 (0/10)	199 (10/10)
Swedana (2min)	6	66.66 (4/6)	33.33 (2/6)	0.00 (0/6)
Swedana (4min)	9	88.88 (8/9)	11.11 (1/9)	0.00 (0/9)

CR=complete response PR=Partial response NR=No response

REFERENCES

1. Busch W (1866), Uber den Enflub Welchen heftige Erysipelin. Zuweilen auf organisierte Neubildungen ausuben verh Naturhist Ges Rhein Westph 23. 28-30.
2. Bruns P (1887) Deil Wirkung des erysipelas auf Geschweulste. Beitr Klin chir 3. 443.446.
3. Colex W.B.(1893) the treatment of malignant tumours by repeated inoculation of erysipelas : with a report of ten original cases. Am.J.Med Sec 105. 487-511.
4. Coley W.B. (1896). The therapeutic value of mixed toxins of erysipelas and bacillus prodigious in the treatment of inoperable malignant tumours. Am.J.Med.Sci 112 251-281.
5. Charaka Samhit a(1949). Edited and published by Sree Gulabvkunveraba Ayurvedic Society. Jamnagar India Chapter XIV. 09-91.
6. Breasted J.H.1930. The Edwin Smith Surgical papyrus. In Licht s.(ed). Therapeutic heat and cold 2nd edn. Waverly Baltimore 196-211.
7. B.s.S.Rao and P.Uma Devi (1996), Multimodality treatment using AK 2123, Hydralazine, radiation and hyperthermia on a transplantable mouse tumour India. J.Med.Res. 104 182-189.
8. B.S.S.Rao and P.Uma Devi (1996). Response of mouse Sarcoma – 180 to cis-platin in combination with radiation and hyperthermia Indian.J.Med.Res.103. 315-322.
9. Overgarrd J (1985). History and heritage – an introduction. In Overgaard J.(ed). Hyperthermia Oncology, Taylor and Francis London 3-8.
10. Pettigrew R.T. Galt JM, Ludgte CM, Smith AN (1974). Clinical effects of whole body hyperthernmia in advances malignancy Br.Med J.4. 679-682.
11. P.Uma Devi and B.S.S.Rao (1993). Response of mouse Sarcoma– 180 to bleomycin in combination with radiation and hyperthermia. Strahlen therapic und onkologic 169. 601-607.