

Bronchial Cryotherapy

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Abstract

The author makes a revision of the properties of cold and describes his action on the endobronchial lesions.

He describes also the indications of cryotherapy in chest diseases and his advantages and complications.

Key-words: colds, cryotherapy, endobronchial lesions.

Coldness properties (haemostasis, analgesia and anti-inflammatory action) are known and used in Medicine for a long time.¹ The Egyptian papyrus of Edwin Smith (2500 AC)² describes the use of coldness to treat skull fractures and infected thorax wounds.

References in Ancient times were also made by Homer and Hippocrates (in hemorrhage and edema on the relief of post-traumatic pain).

Cryotherapy is used in Pneumology as an endoscopic method of bronchial disobstruction consisting on applying a negative temperature over a pathological tissue. The reaction of target tissues changes from the inflammation to necrosis, depending on the temperature reached.

It is mainly a palliative therapy and its use implies the handling of endoscopes and probes specifically designed for such purpose.³

The difficulty in accessing the interior of the tracheo-bronchial tree made it a technique of relatively recent use in bronchology, different from what happened in other areas, as dermatology, in which the organ to freeze is easily reached. As a matter of fact, after an initial interest in 1975, in the USA, were the French and English researchers that, in 1986, have developed and issued the method definitely.³

As the remaining techniques of bronchial disobstruction² (LASER, brachiotherapy, electrocoagulation and thermocoagulation of high frequency), cryotherapy is another tool to integrate a general therapeutic plan of a certain lesion, usually malignant, associating

itself to other modalities (surgery, chemotherapy and radiotherapy). At present such method is part of the therapy set of tools used in the Pneumology Service of Hospital Garcia da Orta for the treatment of endobronchial tumors.

The therapeutic application of coldness is based on the Joule-Thompson's effect (cooling of a gas when expanding, passing from a higher to a lower pressure) and the used gas is the cryogenic nitrogen protoxide. This reaches the zone to be frozen, through a hard probe (with a hard bronchoscope) or flexible (when it is used the fibroscope).

The temperature in the probe extremity is around -90°C. Therefore the expression cryo- is incorrectly used in Pneumology as it implies temperatures around -150°C.³

Cryolesion depends on two factors:¹ the physical action (the most important) and the vascular action (cryothrombosis).

The first⁴ leads to an extracellular crystallization with compression and deformation of cells followed by intracellular crystallization. The presence of intracellular ice has destructive effects upon the cellular membrane.⁵ Cryothrombosis (vasoconstriction, increase on the vascular epithelium permeability and increase on blood viscosity) will complete the lesion.^{1,5}

Peripheral to this lesion emerges an area with heterogenous destruction of vessels and cells – area of associated therapies.⁴ It is in this area that an addictive effect can be reached or a potentiation of chemotherapy or radiotherapy.

The final outcome of a cryolesion is the emergence of an eschar, around seven to ten days later, which is withdrawn with tweezers. This occasion is used to repeat the treatment (usually there are three to five

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sessions of cryotherapy per patient).

It is also thought that coldness exerts an immunologic action³ that remains to be clarified.

The main indication of bronchoscopic cryotherapy is the malignant tumors and certain benign situations (granulomas). It can also be used in pulmonary biopsies (transthoracic route) and the extraction of foreign bodies.

It can be associated to the bronchial LASER and potentiates the chemotherapy (this should be started 24 hours after the cryotherapy) and the radiotherapy (it should start 15 days after cryotherapy). It is also used with success controlling the post-thoracotomy pain through the freezing of intercostal nerves sectioned by the end of the surgery.¹

Complications are rare and mild¹ – fever, bradycardia, hypoxia and hemorrhage on the place of application. It is not an expensive technique, highly effective and practically without risks.

It has a vast field of application: dermatology (tumors), proctology (hemorrhoids), neurology (tumors), vascular surgery, ophthalmology (glaucoma), ENR (tumor), gynecology (tumors and condyloma), cardiothoracic surgery, urology (prostate tumors), phlebology (varix), orthopedics (tumors), maxillo-facial surgery (tongue tumors), cardiology (arrhythmia) and in veterinary medicine. The setback is a delayed action and the need of multiple treatments, preventing it of being used in emergency situations. ■

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