ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN — POLONIA
VOL. XLIX, 23 SECTIO D 1994

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The Use of Vegetable Proteolytic Enzymes in the Treatment of Surgical Diseases*

Zastosowanie roślinnych enzymów proteolitycznych w leczeniu schorzeń chirurgicznych

In the last decade a number of enzymatic preparations have been used in various fields of medicine. The usefulness of enzymes in the process of treatment is bound with their necrolytic, antiinflammatory and resorptive properties. A favourable effect of preparations with hiauronidasic action has been proved, as well as of pancreatic proteolytic enzymes. Among proteolytic enzymes of vegetable origin papaine is of special interest.

Papaine is a proteolytic enzyme with molecular weight from 21,000 to 23,000 daltons, made up of 212 aminoacids. This enzyme is active both in the acid and alkaline environment, with the optimal activity at $pH=6.5$, in the presence of reducing substances such as: glutation, cysteine, glycine, sulphydryl compounds. Inactivation of the enzyme takes place under the influence of oxidants (1).

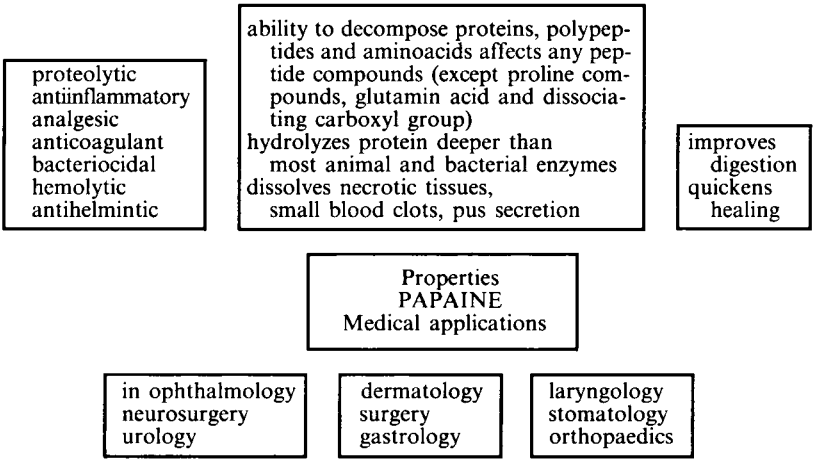
Papaine, as a proteolytic enzyme, has wide application in industry and medicine. It has the property of clotting milk and of digestive protein. Papaine is also an enzyme activating plasminogen to plasmine, which dissolves fibrin. This enzyme affects liquefaction of the upper respiratory tract mucous secretion and liquidates inflammations. A cumulative statement (listing) of papaine applications in different medical specialities and its properties are presented in Table 1.

OWN INVESTIGATIONS

71 patients were treated because of various suppurative diseases at the surgical ward of the District Hospital named after Jan Boży in Lublin in the years 1991—1993. In 21 patients, who constituted the control group, therapeutic methods commonly accepted in such ailments were used. In 47 patients papaine preparations were administered additionally. Soluble papaine produced by the

* The paper presented at the poster session during the 56th Congress of Polish Surgical Association, Lublin 1993.

Table 1. Properties and medical applications of papaine



company "Merck" with the activity of 6,000 USP. Papaine preparations in liquid form (0.2—0.5% solutions in physiology salt) and solid form i.e. ointment containing papaine. There was also used papaine immobilized to sterile prepared gauze dressings (2).

Table 2 presents the analysed material of patients with respect to the kind of disease and number of patients. In both groups of patients similar general treatment was used, which is commonly accepted in modern medicine for such cases. Antibiotic therapy was also similar, differences consisting in individual sensitivity of bacterial flora. For washing out and rinsing of the wounds solutions of rivanol, hibitane, hydrogen peroxide and of physiologic salt were used. In the group of patients with burns 10 were admitted to hospital because of scalding (with water, milk, oil), 4 with flash burns, 2 burnt with hydrochloric acid. In all the patients the surface of burns amounted to 10—15% of total body surface.

In the group of patients with diabetes changes involved peripheral parts of toes. In the group of 16 patients with trophic ulcerations 10 cases revealed changes in the course of postthrombotic syndrome of the lower limbs, in the remaining 6 cases the changes were bed-sores of the sacral-gluteal region.

All patients with necrotic-haemorrhagic form of pancreatitis during the first operation underwent a test of the biliary tract and removal of necrotically altered, not closely connected with the base fragments of pancreatic tissue and fat from the retroperitoneal space. The postoperative wound was left open. In the postoperative period patients were treated according to the modern requirements of intensive care (3).

In all patients dressings were changed at similar intervals. The dressing material was different in group I and II by using substances for demarcation of necrotic tissues.

Table 2. The classification of patients with respect to the kind of disease

Kind of disease	Number of patients	
	Group I	Group II (control)
III burns	16	6
Diabetic foot	7	5
Trophic ulceration	16	5
Haemorrhagic-necrotic	—	—
Inflammation of pancreas	8	8
Total	47	24

Cleansing of the wound of necrotic tissues and pus secretion in patients from group I occurred, on the average 3.5 days earlier than in group II. Granulation appeared in group I after 6—8 days, while in group II after 10—16 days. Most patients from group I notified a considerably decreased feeling of pain and burning after change of the dressing. The use of papaine preparations in group I diminished the amount of infiltrate and caused an increase of the quantity of forming macrophages and fibroblasts. On the 4th—6th day segments of epithelization appeared on the periphery of the wound. Papaine preparations gave rise to a considerable acceleration of cleansing the wounds of microorganisms, reducing and causing desirable fall of body temperature. There was observed a decrease of oedema of the edges of the wound as well as a decrease of inflammatory reaction. A beneficial effect of papaine in the treatment of suppurative fistulae of badly healing wounds and of burns was described in literature (4—6). There was also described the use of papaine in the treatment of different ailments (7). Our results concerning the use of papaine preparations and immobilized papaine in the treatment of badly healing wounds are consistent with results of other authors. Summing up all the obtained results it can be stated that the application of proteolytic enzymes of vegetable origin speeds up cleansing of wounds of necrotic tissues, stimulates growth and maturation of granulation which contributes to a decrease and epithelization of the wound.

Conclusions

1. The use of papaine preparations is an objective way of treatment of badly healing and supporating wounds.

2. The therapy of badly healing wounds using papaine preparations gives a possibility of shortening a persisting suppurato-necrotic inflammatory process (3—5).

3. Immobilization of papaine for the dressing material lets an increase of intervals between changing of dressings.

4. Dressing material with immobilized papaine can be used for local (topical) treatment of patients with extensive necrotic processes in the wound, with a lot of pus secretion.

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Otrzymano 1994.12.09.

STRESZCZENIE

Badania obejmowały próby nad immobilizacją papainy na sorbentach poliamidowych PA-6. Wydajność immobilizacji wynosiła ok. 60%. Po 30 dniach aktywność preparatu zmniejszyła się do 30%.

W badaniach klinicznych określano wpływ roztworu papainy w DMSO z dodatkiem antybiotyków i antyseptyków w leczeniu trudno gojących się ran. Zastosowanie preparatu 3—5-krotnie powodowało oczyszczenie rany przez rozpuszczenie i łatwiejsze oddzielenie od podłoża tkanek martwiczych i skrzepów krwi. Ułatwiało to działanie innych składników preparatu, np. antybiotyków, czynników regenerujących.

Analiza wyników klinicznych wykazała korzystniejszy wpływ zastosowanych preparatów niż dotychczas stosowanych w leczeniu owrzodzeń troficznych podudzi oraz u chorych z martwiczo-krwotocznym zapaleniem trzustki, leczonych metodą laparotomii.