

DEPARTMENT OF EXPERIMENTAL SURGERY AND RESEARCH ON BIOMATERIALS  
CLINIC OF TRAUMATIC SURGERY OF MEDICAL ACADEMY IN WROCLAW  
Poniatowskiego 2, 50-326 Wroclaw, Poland

REPORT

CLINICAL INVESTIGATIONS OF HYDROGEL DRESSINGS HDR IN COMPARISION  
WITH FOREIGN HYDROGEL DRESSINGS

WROCLAW

## CLINICAL INVESTIGATIONS OF HYDROGEL DRESSINGS HDR IN COMPARISON WITH FOREIGN HYDROGEL DRESSINGS

The Clinic of Traumatic Surgery, and the Department of Biomaterials Examination performed detailed investigations of an experimental series of hydrogel dressings obtained *by* the radiation method. These investigations concerned the dressing having a symbol HDR- 1 (with neomycin) and the other one with a symbol HDR- 2.

The above mentioned investigations covered following problems:

1. Laboratory investigations of aqueous extracts (determinations of pH, electric conductance and dry residue).
2. Biological investigations *in vitro* of aqueous extracts (hemolytic action on human erythrocytes and toxic action on bull sperm),
3. Biological investigations *in vivo* (intra-dermal toxicity in rabbits, dermal contact allergic tests, the reaction of subcutaneous tissue, of peritoneal cavity and muscles of rats and rabbits, as well as the effect of hydrogel dressings on the process of healing of rabbits deficient skin parts).
4. Preliminary clinical examinations (early and distant local reaction, the process of healing different wounds, handy use of dressings).

On the ground of the obtained results it has been selected the best hydrogel dressing having a symbol HDR- 2 and showing optimum biological properties with the indication to use this biomaterial in practice.

The Institute of Radiation Technique, Technical University in Lodz has transmitted the hydrogel dressing HDR (production series) along with the hydrogel dressing produced by the company Geistlich and Sons Ltd. being found on Western markets for comparative clinical examinations

The above dressings had two dimensions (24 x 24 cm and 12 x 12 cm), with the surface in the form of a grid on this side, which is in the immediate contact with the wound. The above surface consisted of 1 x 1 cm grids, and the depth of grooves from 1 to 1.5 mm.

All the dressings were sterile, placed in an aesthetic and practical package.

In the Clinic of Traumatic Surgery, Medical Academy in Wrocław following investigations have been carried out:

1. Determination of an early and distant skin local reaction for HDR dressing in comparison with Geliperm dressing.
2. The observations of the process of healing the wounds and epithelization after using HDR and Geliperm dressings.
3. Finding out, if the dressings are handy in operation.
4. Making out photographic documentation (slides) in colour, in three copies.

## DISCUSSION

On the ground of performed skin tests with HDR and Geliperm dressings no irritant reaction was observed after brief and long contact of these materials with human skin. In the clinical material prevailed burn wounds, and then post-traumatic wounds and bedsores as well as ulcerations. The places, where hydrogel dressings were used covered practically all the parts of the body owing to great elasticity of both dressings. Thanks to great hydrophilicity and adhesion to the surface it is possible during the change of dressings to remove exudation with purulent contents and tissue fragments also on hairy skin where around the follicles the development of purulent processes is especially facilitated.

In practice it was found that removing HDR dressings is easy and painless for the patients. No damage of granulated tissue and epidermis being formed was observed. On the other hand it was found that the process of skin regeneration proceeds much faster than in the case of using traditional dressings.

The frequency of changing hydrogel dressings was depended on the phase of wound healing. In the stage of exudation, when under the dressing a great amount of secretion is collected, the most favorable is a change every 12 - 24 hours. This period of time may be prolonged only then, if in the wound begin regeneration processes in the form of the development of tissue granulation processes, and later epithelization.

It is to be emphasized that taking out from the package and putting on the wound the whole HDR lobes did not cause any difficulties. The grooves on one side of HDR surface makes it possible to introduce disinfectants or antibiotics under the dressing.

Moreover, it makes possible to remove excretion from the wounds.

## CONCLUSIONS

On the basis of performed clinical examinations of HDR dressings (production series), and in comparison with Geliperme dressings it has been found what follows:

1. HDR dressing may be applied with success for all the types of wounds which are found in the surgical wards.
2. Physicomechanical properties of HDR dressings enable a simple and painless removing of HDR dressings.
3. The use of HDR dressings favourably affects the course of wound healing and regeneration of damaged tissues.
4. On the ground of clinical examinations it has been found that HDR and Geliperme dressings show similar therapeutic and physicomechanical properties. They enrich the assortment of dressings materials.

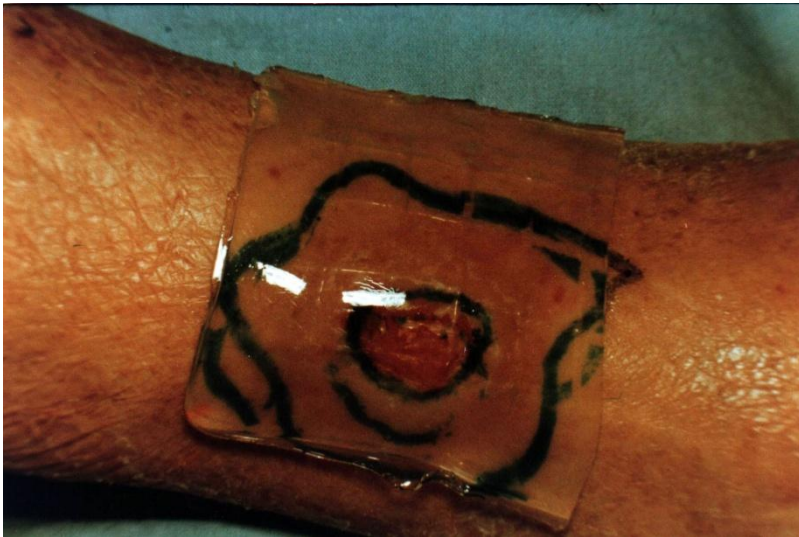


Fig.1, Fig.2, Fig.3. Patient W.K., 40 years old. Traumatic damage of skin and subcutaneous tissue. The wound infected by *Staphylococcus aureus*. The course of wound healing.



Fig. 4. Patient G.M. 32 years old. Bruise wound of the skin, passing to the subcutaneous tissue. <the course of wound healing.



Fig. 5. The same patient. The tissue defect is filled out with tissue granulation tissue, as a result of healing with hydrogel dressing. The wound is markedly less, and the skin is new and elastic.

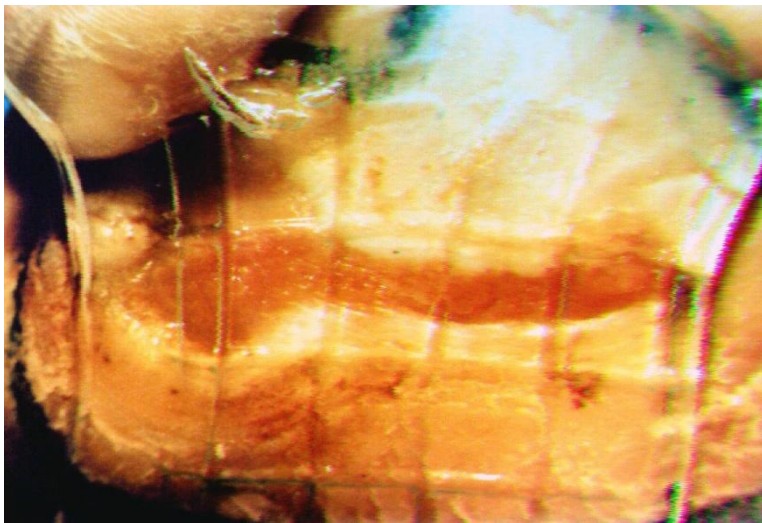


Fig. 6, Fig. 7. Patient K.K., 52 years old, with anemic diabetes. Trophic ulcer with vast defect in sole area. The course of healing process.



Fig. 8. The same patient. Marked regular scar in the area of previously vast skin defects and that of subcutaneous tissue. Superficial wound of only 0.3 – 1 cm

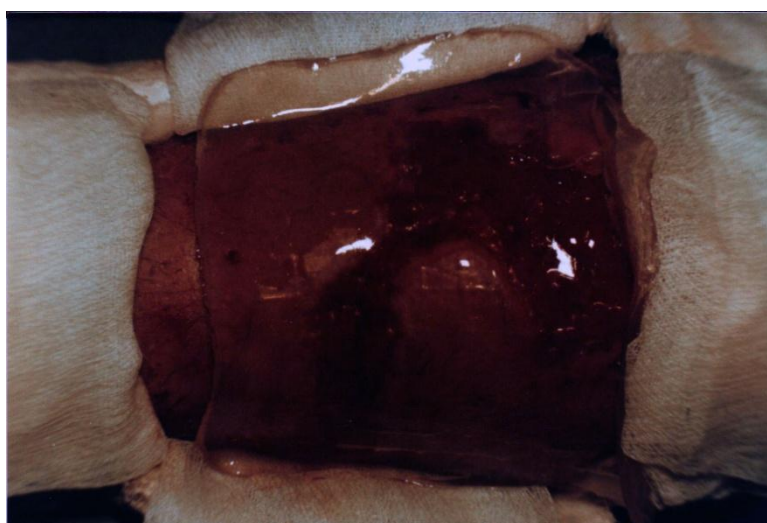
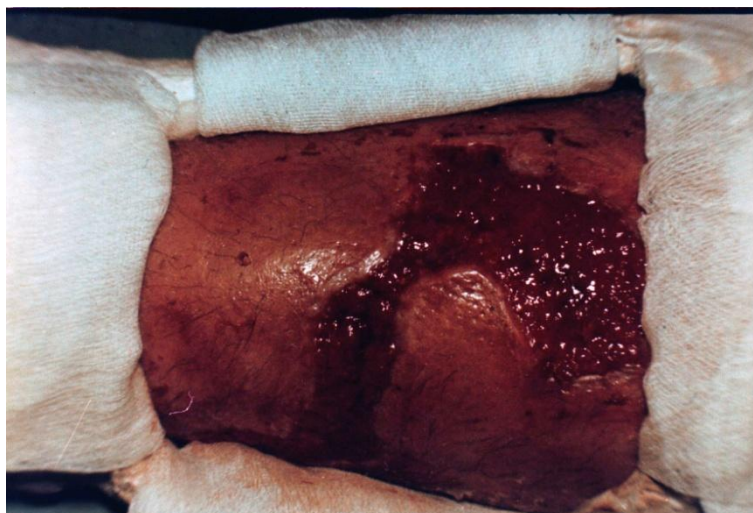


Fig. 9, Fig. 10. Patient W.S. 52 years old. A vast shin wound caused by open fracture complicated by purulent process. The shin immobilized by gypsum dressing. Hydrogel dressing placed on the wound through a window cut out in gypsum and used up of healing process.





Fig. 11, Fig. 12. Patient M.K. 52 years old. Tissue exudates. The course of healing. Under the action of the hydrogel dressing the tissue swelling is diminished. The skin was recovered and obtained normal appearance.



Fig. 13. Fig. 14. Fig. 15. Patient P.F. 18 years old. The fracture of shin treated by external stabilization. The wound infected by *Pseudomonas bacilli*. Healing was carried out by the use of hydrogel dressing containing antibiotic. Scars after healing up – smooth and elastic.

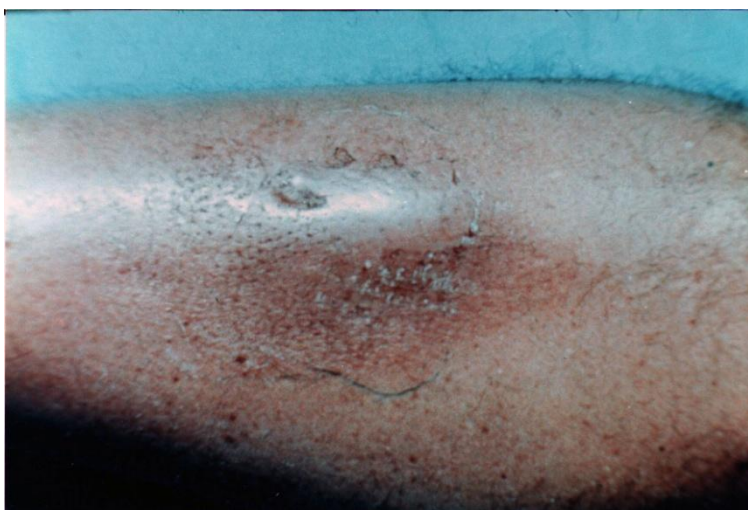


Fig. 16. Fig. 17. R.Z. 42 years old. Bruise wound of the skin. The course of healing by means of hydrogel dressing.



Fig. 18. Patient P.T. 22 years old. The final effect of healing skin losses after open fracture complicated by inflammatory process.

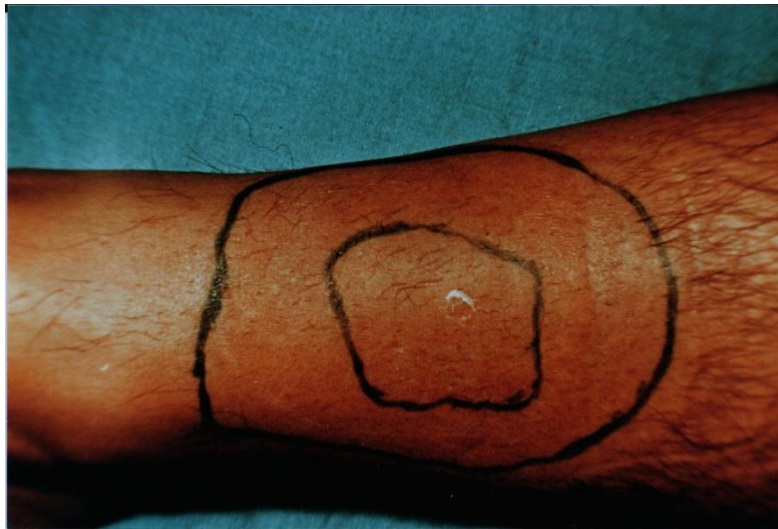


Fig. 19. Patient L.S. 52 years old. The state after healing up the worried wound of shin. The effect of healing with hydrogel dressing is visible.