TREATMENT OF THE PATIENT WITH BURNS, WITH REFERENCE TO THE PROFLAVINE POWDER TECHNIQUE

BY

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The trend of modern surgical thinking is to focus attention upon a stated lesion rather than to take into conception a view of the patient as a whole. In certain diseases the actual lesion is the outward sign of a complex interplay of pathophysiological processes affecting the whole organism. The corollary is also true as applied to the effects of injury. The local damaged area calls the same general processes into action, and it is important to recognize and understand the reactions of the body to injury. It has become commonplace to discuss treatment under two headings—general and local—but too often inadequate attention is given to the former. Since the measures instituted in the general treatment often exert a local action, and vice versa, it appears advisable to modify this classification and to consider the patient as a whole. The patient with a major burn must be treated from this point of view.

Since the outbreak of the present war the subject of burns has received considerable attention and our knowledge has consequently been enriched. The division of the local lesion into three degrees instead of the classical six of Dupuytren is helpful, but it is pointed out that several days usually elapse before it is possible to classify a burn, and all three degrees may be represented. The psychological aspect requires attention, especially with major burns in exposed parts of the body—reassurance and encouragement must be given as regards scarring, with disfigurement and dysfunction. In burns of the face an early inquiry with respect to these matters is usually made by the patient. For the relief of pain morphine must be given in adequate amounts, and if a quick result is desired it should be administered by the intravenous route. Interesting experiments have been carried out on the effects of nembutal, and it is reported to reduce the fluid loss of the burned surface. If these results are confirmed and applied clinically this drug may be used also as a soporific with a double advantage.

Plasma Loss

This is rapid at onset, and may be severe in amount. Further, the loss of plasma is a continuous process extending over a long period of time in the injured area. As a result, hypoproteinaemia develops. In the pathogenesis of this condition more than one mechanism is operative. There is the loss of plasma at the site of injury, and in addition the output of nitrogen in the urine is increased. The patient is unable to ingest an adequate protein diet during the initial period following his injury.

Later there may be damage to the liver as the result of toxic absorption, with consequent impairment of function in the synthesis of plasma albumin. Acute hypoproteinaemia may develop a few hours after a severe burn, and both its presence and its degree must be rectified and corrected. Chemical analysis of the blood should be carried out and the plasma albumin fraction measured. In addition, the haemoglobin percentage must be determined, together with an enumeration of the red blood cells. To rectify this condition plasma transfusion is required as early as possible and in adequate amount. In severe cases a minimum of 1,000 c.cm. is given at once, and quickly in rate. Further quantities may be necessary over a period of time, and the clinical condition of the patient is the simplest guide. Fluid-balance charts must be instituted and the output of urine watched carefully. When the patient is able to ingest it, he should be put on a high-protein diet containing a large proportion of essential amino-acids. For an adult of average size 150 g. of proteins per day can be given, the best foods being milk, lean meats, and eggs. Amino-acids may be given orally if there are digestive disturbances, but this is an expensive method. In an excellent

review of this subject Elman and Lischer (1943) call attention to the value of amigen, an enzymic digest of casein and pork pancreas containing amino-acids and a small quantity of polypeptides. Amigen can be administered orally and intravenously; as much as 300 g. has been given in 24 hours by the latter route. A high protein intake is necessary to safeguard the live cells from the effects of toxic absorption.

Sulphonamide Therapy

It is not our practice to give sulphonamide drugs orally as a routine. In cases of severe toxic absorption and liver insufficiency they may be harmful. Each patient must be carefully considered from this angle and the general condition assessed. Oral chemotherapy is beneficial in cases of haemolytic streptococcal infection with marked pyrexia. An adequate fluid intake is necessary and the response of the patient should be carefully noted. We have ceased to employ these drugs locally in the injured area.

After a period of three or four days secondary anaemia frequently develops, and becomes marked unless measures are taken to combat it. Iron therapy, using massive doses, is instituted. In severe burns one or more blood transfusions may be required during the second and third weeks, and it is our practice to transfuse when the haemoglobin falls below 70%. Hypovitaminosis is corrected by the daily administration of vitamins B and C. Careful attention to the cardiac and respiratory systems is necessary, especially in elderly patients, and cardiac failure or pulmonary infection is treated along routine lines. In the case of septic burns constant scrutiny of the condition of the heart, liver, and kidneys is essential.

In countries where malaria is endemic this infection may be a complicating factor in cases of burns. We have shown elsewhere that trauma may precipitate an attack of malaria in a patient whose disease is quiescent. Thus in patients who are pyrexial in malarious areas it is a wise precaution to examine the blood for malaria parasites on several occasions.

Treatment of the Wound

Wound treatment is carried out under strictly aseptic conditions in the operating theatre, usually without general anaesthesia; morphine should be administered subcutaneously half an hour before the operation, and in severe cases this can be given intravenously with good effect. The toilet of the wound is careful and conservative. Contaminants are mopped away with a solution of normal saline, and pieces of dead tissue are lifted off. Normal skin surrounding the wound is carefully cleansed with spirit. Blisters are evacuated carefully by pricking with a sterile needle. Dry proflavine powder is lightly smeared over the wound, the whole lesion being thinly coated. The wound area is covered with one layer of wide-meshed gauze impregnated with vaseline and, over this, two layers of wide-meshed gauze with a liberal supply of cotton-wool. The dressing is bandaged firmly to form a pressure-dressing with either plaster-of-Paris or calico bandages, and this initial dressing is not removed for a minimum period of five days. After the first re-dressing the time-interval between dressings is increased from 10 to 14 days. Proflavine powder is dusted on the wound at each re-dressing. The wounds in burns of third degree should be skin-grafted as soon as they are in a satisfactory state.

Use of Plaster-of-Paris

We have with advantage used plaster coverings for the dressing in certain parts of the body. Attention is called to the value of the "plaster glove" for the treatment of burns of the hand. The toilet is carried out as described, each finger being covered separately with vaselined gauze and dry gauze. The following technique is employed for the application of the "plaster glove."

The patient is instructed to place the hand in the position of rest, the fingers being partially flexed at the interphalangeal and metacarpo-phalangeal joints, with the tips of the index finger and thumb in opposition. The wrist-joint is held in partial dorsiflexion. A rolled pad of cotton-wool is placed in the palm of the hand as a support for the fingers, and the hand and forearm are covered with a liberal supply of that material. The hand, wrist, and forearm are then encased completely in the plaster glove, which extends as

high as a point two inches below the elbow-joint. The limb is elevated for several days in order to minimize tissue oedema. Active exercises are instituted for the fingers after 48 hours, together with active exercises at the elbow- and shoulder-joints.

In the case of burns of the foot a similar technique is employed. The glove is left in position for a period of two to three weeks. Other regions of the body have been treated by the proflavine-plaster technique, including the leg, thigh, forearm, arm, shoulder, chest wall, and abdominal wall. In the case of large joints such as the knee and elbow, bandages are applied, with plaster above and below, in order that active exercises may be carried out. There are several advantages in the plaster technique. The dressing is comfortable and is held firmly in position. If evacuation of the patient is necessary, travelling in plaster is comfortable. In tropical and subtropical countries, where flies are numerous, the plaster forms a barrier against maggot infestation.

In order to illustrate the results obtained reference is made to the following typical cases among those we have treated by the powder. It is our practice to investigate the bacterial flora present in the wound from its inception until healing occurs. On account of the necessity for evacuation it was not possible to hold every patient until healing was established. Nevertheless we have investigated sufficient cases treated by this method to be very impressed with the end-results.

Illustrative Cases

Case 1.—Trooper aged 30. Admitted with major burns—second and third degrees—involving face, neck, forearms, hands, right chest wall, anterior abdominal wall lower half, penis, scrotum, right buttock, and both thighs. Treated with proflavine powder as described. Plasma transfusion 1,350 c.cm. Bacteriology of burns showed coliform organisms. Four days after admission, plasma transfusion 1,350 c.cm. Seven days later re-dressed. Coliform organisms present. He was re-dressed at intervals, and bacteriological examinations showed *B. proteus*, *Staph. aureus*, and coliform organisms. Thirty-six days after the first treatment the wounds were clean, sloughs had separated, and healthy granulation tissue had formed. All areas not healed were skin-grafted, using split-thickness grafts. There was a good "take," and in 69 days the patient was evacuated in good general condition, walking well, and all wounds had healed save a small patch on the right thigh which was in process of healing.

Case 2.—Fireman aged 38. Admitted with major burns—second and third degrees—involving both lower extremities, buttocks, penis, and lower part of the back. The patient had been treated at another hospital, the injury having occurred 18 days before we saw him. He had received sulphathiazole orally, 45 g., and sulphanilamide powder locally. His general condition was very poor and secondary anaemia was present—Hb 68%. Two pints of blood were transfused and routine proflavine treatment given for the burns, which were very infected. A second blood transfusion, one pint, was given 12 days later and again on the 47th day. Dressings were changed at intervals, and bacteriological investigations showed *B. proteus*, *Staph. aureus*, coliforms, and diphtheroids. Patient was evacuated 67 days after admission in good general condition, walking well, and with wounds healed.

Comment

It is of interest to compare Cases 1 and 2, as these burns were of comparable severity. In Case 1, treated with proflavine powder, the general condition did not show the marked toxicity of Case 2, and no blood transfusions were required as in the latter. The lengths of stay in hospital before healing was achieved were 69 and 67 days respectively. The haemolytic streptococcus was absent in all cases, and we believe that such infection can be prevented by the use of this method. Bacteria met with in our cases were *Staph. aureus* and *albus*, *B. proteus*, coliforms, diphtheroids, and *B. pyocyaneus*. In the past it has been stated that the acridine compounds retard the healing process in a wound. This has not been our experience using powdered proflavine in burns and also in other types of wounds. On the contrary, healing is usually rapid and there is a noticeable absence of scarring, the resulting skin being supple and of excellent quality. The hands we have treated are functioning normally and no contractions have developed. It is recognized that a burn of the hand may be of such severity that a deformity will result no matter what treatment is given. There has been no instance of a deleterious general effect from absorption of proflavine at the wound surface.

Summary

In the treatment of burns the patient as a whole must be carefully considered, and the salient features in his management are here discussed. Powdered proflavine has been used in the treatment of the wound and the results achieved are described. This chemical substance is of proved value, and we employ it as a routine. Attention is called to the use of plaster-of-Paris as a covering for the dressings, and in particular to the "plaster glove" in burns of the hand. Proflavine powder does not retard the process of healing, and the resulting healed area showed a remarkable freedom from scarring, the skin being supple and of excellent quality.

I am indebted to Major T. Day, R.A.M.C., for carrying out bacteriological examinations on a large series of patients. Col. W. A. Y. Knight, A.M.S., commanding the hospital, has kindly allowed me to publish the case histories.

REFERENCE

Elman, R., and Lischer, C. E. (1943). *Surg. Gynec. Obstet.*, **76**, Int. Abst. Surg., 503.

Medical Memoranda

Enucleation of Six Ovarian Dermoid Cysts from one Woman, with Conservation of the Ovaries

The following case record illustrates the scope of conservative surgery on the ovaries.

CASE HISTORY

Miss J., aged 21 (No. 24703). During a routine examination a swelling was found in this girl's abdomen. At the West London Hospital a provisional diagnosis of ovarian cyst was made, and her name was placed on their waiting list. As a result of the air raids in London in the early months of 1944 she came to Oxford and was admitted to the Radcliffe Infirmary. On the previous diagnosis, with which I had no reason to disagree, the abdomen was opened. The operative details are as follows:

Left lower paramedian incision. A bluish cystic swelling arising from the left ovary was immediately apparent; it was about 9 in. long, and had the appearance of a multilocular ovarian cyst with an extension running up towards the left. The uterus was normal in size and position. The right ovary was about 5 in. long, and clearly contained two separate cysts, one at each pole. Each cyst in the right ovary was a little smaller than a golf ball, and was yellowish in colour, as if filled with sebaceous material such as is commonly present in dermoid cysts.

These two cysts in the right ovary were both enucleated easily and bloodlessly, and the ovary was repaired. Because of the findings in the right ovary the localized swelling of the left ovary was re-examined. Though each locule was obviously filled with watery fluid, there were in addition a few fat globules to be seen through the capsule. On the supposition that the left-sided cyst was also a dermoid, enucleation was proceeded with. Surprisingly, the cyst turned out to be not one but four quite separate ovarian dermoids. Three were enucleated without difficulty, though one was accidentally punctured; the fourth was removed along with a piece of thinned-out ovary. The ovary was repaired and the abdomen closed.

Convalescence was uninterrupted. Before operation the patient menstruated every two months; subsequently she reported her periods as "regular every month."

All six cysts contained hair. The two on the right side were largely filled with sebaceous material; the four on the left side with watery fluid. Histological examination confirmed the clinical diagnosis of benign cystic ovarian dermoids; a great variety of tissue elements were identified.