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## PUNCH PRESS INJURIES TO THE HAND

ROBERT H. CLIFFORD, M.D.\*

The hand and the punch press are natural antagonists. Encounter between these two have only one constant feature. The punch press always wins.

These machines are very carefully designed and built to incorporate safety features. It is difficult to understand why the workmen constantly risk their livelihood by misusing these devices. However, in an individual area such as this, the punch press injury is a very common occurrence. The injuries range from finger tip amputations through all types of injuries to forearm amputations.

This discussion is limited to the so-called massive hand injury. Massive hand injury can be defined as that injury including more than the fingers and in which there is loss of some portion or damage to all the major components of the hand, i.e., skin, tendons, muscles, bones and nerves.

When a patient with this type of injury is seen, the problem is not what has been lost, but what remains that can be made useful. It is important to realize that parts still viable are not necessarily parts that can be made useful. Fingers, for example, that are crushed and battered, may survive. They may survive, however, only to become a rigid prong interfering with the use of the hand. Thus, they are an impediment and should be removed at the time of original injury.

The difference between a part that is merely viable and a part that can be made useful is indefinable. It can be judged only by the experience of the operator and careful consideration of the occupation of the injured man.

The following cases will illustrate the problems encountered and the compromise with nature that has been accomplished.

The first case is that of a machine operator who reached into a running machine to dislodge a malformed piece of work. Figure 1 and 2 show massive avulsion of skin of web, amputation of the terminal phalanx and one-half of the proximal phalanx of the thumb, amputation of the index and partial amputation and filleting of the middle finger. This middle finger was viable, but badly fractured with loss of its radial surface skin covering. It was therefore decided that this digit was non-salvageable.

The treatment was based on the fact that he had two good fingers and a stump of thumb, the latter having no covering. Simple skin grafting would be to no avail, as it would provide no cushion against the exposed bone. An abdominal pedicle graft was then planned and utilized. (Fig. 3.) The patient now has a soft, flexible covering with adequate subcutaneous padding for his thumb and radial side of the hand. The thumb is moveable, providing him with a very short but flexible and apposible thumb. He has returned to his usual job.

The second case is that of a man injured by a punch press. The x-rays showed

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Fig. 1



Fig. 2

Fig. 1, 2, and 3—Case 1.



Fig. 3



Fig. 4



Fig. 5

Fig. 4, 5, and 6—Case 2.



Fig. 6



Fig. 7



Fig. 8

Fig. 7, 8, 9, 10, 11, and 12—Case 3.



Fig. 9



Fig. 10



Fig. 11

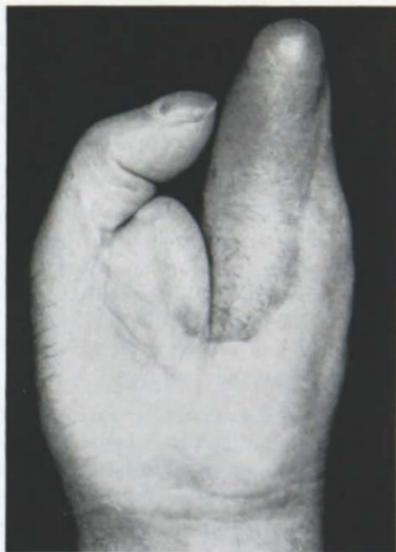


Fig. 12

Fig. 7, 8, 9, 10, 11, and 12—Case 3.



Fig. 13



Fig. 14

Fig. 13 and 14—Case 4.

extensive fracture damage and amputation of his fingers. (Fig. 4.) In addition, there was avulsion of the skin of the palm, loss of tendons and small muscles of the hand. Abdominal pedicle flaps were used and after many stages, formed and thinned to produce two stubby fingers. Tendon transplants added strength to these fingers. Figures 5 and 6 show this hand with these stubby but useful digits.

Figures 7, 8 and 9 show a third injured hand with the same etiology—a punch press injury, showing massive loss of three fingers and portions of the hand itself. The x-rays show the fracture damage. The second metacarpal was shortened and the third and fourth metacarpals removed to narrow the hand. The wound was covered by an abdominal pedicle graft as in Figure 10. The final results show a functional claw-hand, Figures 11 and 12, with soft pliable skin replacing that which was lost. A tendon graft to the inner aspect of the fifth finger has added strength for opposition to the thumb.

Figure 13 shows a similar fourth case with loss of the central portion and leaving only the thumb and fifth finger. The second, third and fourth metacarpals were removed. There was adequate viable skin to affect a primary closure. Figure 14 shows a postoperative result of this hand which is a strong, grasping claw that the patient has learned to use and he has returned to his original job.

These cases show clearly the damage that can be done by these machines and illustrates dramatically that these hands cannot be repaired. Repair implies the return to the condition before injury. It is obvious that none of these hands have been brought back to anywhere near their normal condition. The result of treatment is therefore a salvage and a compromise with nature and not a repair.