however, to sterilize his cotton and gauze by steaming or baking them, and will dip his hands in sublimate solution after washing them. The main thing, however, is to prevent the accumulation of fluid in the peritoneal cavity; if the drain is so placed and so cared for that this is accomplished, the patient will recover, even after desperate and gruesome operations. On the other hand, if drainage is not used, and the fluid accumulates, and for any reason the peritoneum fails to absorb it, the patient will surely die in spite of all the refinements of antisepsis.

It remains to consider certain cases in which drainage with the glass tube is not sufficient; these are those cases in which there is free oozing from some points deep in the pelvis, such as the bed of a pyosalpinx, an extra-uterine pregnancy, or a tumor of the broad ligament, and in which the condition of the patient is such that a further loss of blood would be disastrous and a prolongation of the operation would be unwarrantable. There are also certain cases where it is desirable to prevent the intestines from falling into a cavity which is wholly or in part lined with a suppurating membrane, or where a perforation of the bladder or intestine has been found or made so that a fistula may reasonably be expected; in these cases packing with iodoform gauze is of the greatest service, and the best way of employing this is certainly by the method of Miculicz. This is applied in the following manner: The centre of a large square of iodoform gauze, from two to three feet on the side, is seized with the clamp or sponge-holder and pushed to the very bottom of the cavity to be drained; the fingers of the left hand are now carried inside of the sack thus formed, and there expanded so that the gauze is spread over every bleeding point and pushed into any suspicious cavity. Strips of iodoform gauze, three inches wide and a yard long, are now pushed down over the fingers, using a clamp or other smooth instrument until the cavity is filled; this usually requires from three to five such strips. I usually employ a glass drainage-tube reaching to the bottom of the pelvis behind the gauze packing, in order that the irrigation fluid and bloody oozing may be rapidly withdrawn during the first twelve hours after the operation, after which the glass tube can be taken out. Nevertheless, this use of a glass drain is not customary, as the gauze packing will remove a large amount of fluid in the pelvis by capillary attraction; it is therefore usually covered with a mass of crumpled sterilized gauze to absorb this fluid. I think it is better, however, to wrap a piece of rubber dam around that part of the gauze packing which is external to the wound, lengthening it if necessary by pinning to it a piece of moist gauze, so that the whole can be carried between the legs of the patient, or at one side, into a mug which will receive the drainage fluid. This modification makes it much easier to keep the bandages and dressings dry and clean, and facilitates drainage by adding the principle of the syphon to that of capillary attraction.

The strips of gauze should be removed from the sac after from twenty-four to forty-eight hours, the sac itself on the fourth or fifth day; it is not well to try to remove it by means of a string attached to the centre, as recommended by Miculicz, at any rate it cannot be done readily when the neck of the sac is so small as I make it. On the fourth or fifth day, however, by gently unfolding or pulling on the edges of the sac, first at one point and then at another, the place will soon be

found where it can be drawn out, and starting from this point the whole can be gently removed, the cavity syringed with peroxide of hydrogen, and then a fresh strip of gauze put into it. It is astonishing how rapidly the cavity closes and the abdominal wound unites. I have used this method of packing in a large number of difficult and serious cases, and I have been so thoroughly satisfied with it that I have no hesitation in employing it.

I shall say little in regard to draining the abdominal cavity through the vagina. There is no doubt but that it is a useful procedure in vaginal hysterectomy and sometimes in total extirpation of the uterus; but, as a rule, where the abdomen has been opened from above, I prefer to use drainage through the abdominal wound, because the vaginal drainage is neither so efficient nor so convenient, nor yet are we so certain of draining the pouch of Douglas while we have to depend on capillary attraction to raise the fluid to the level of the perineum. It is, moreover, difficult to keep the capillary drain clean and away from the infection when it protrudes from the vagina.

I could say much more about drainage; but it is not necessary, for it is impossible in a written communication to explain all the little points on which a successful use of it depends. It is a practical refinement of the art of surgery of the highest order of skill and of the greatest possible importance, and it will serve well those are content to study its details with care and thoroughness. Its advantages are evident to those who know best how to use it; of its disadvantages the contrary may be said.

NOTE ON FRACTURES OF THE HUMERUS AT THE ELBOW-JOINT.¹

BY CHARLES W. DULLES, M.D., PHILADELPHIA.

THE treatment of fractures at the lower end of the humerus is one of the well-recognized difficulties in surgery. The reason for this is chiefly the complicated character of the elbow-joint, the number of bones entering into it, the anatomical features of the joint, and the disturbance of function which results from slight displacements. The danger of permanent stiffness of the joint used to be regarded as one of the most serious features of these cases; but in recent years this danger seems to be more usually avoided, and mere stiffness is not feared as it once was. The point in regard to the treatment of these fractures which now attracts most attention is the very important one of preserving the normal inclination of the plane of the joint surface of the humerus to that of the principal axis of its shaft. This forms on the radial side a moderately acute, and on the ulnar side a moderately obtuse angle, resulting in a slight angle between the axes of the forearm and of the upper arm in the position of extension, which contributes very materially to the usefulness of the arm for a variety of purposes, and especially for carrying weights in the hand. The importance of this has been frequently and strongly emphasized of late years, and has to a certain extent dominated the treatment of injuries near the elbow-joint. Another source of trouble in fractures at the lower end of the humerus, to which as much attention should be paid, is rotary displacement of the

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fragment or fragments of the humerus. The result of this displacement is sometimes exceedingly unfortunate, the external condyle, for example, being displaced in a direction forward and toward the middle line (ventral) producing a deformity which is not uncommon, and which destroys what is called the "carrying-angle" as effectually as the more commonly recognized upward displacement of the internal condyle, because it destroys the normal relation of the radius to the humerus and to the ulna, and materially restricts the motion of supination.

To understand the condition involved in fractures at the lower end of the humerus, it is necessary to study the normal mechanical conditions of this joint. Its complicated character makes verbal description almost impossible; but certain points, easily demonstrable from the bones, ought to be understood and remembered.

The first of these is the well-known obliquity of the plane of the joint, by which the really articulating bone—the ulna—in a position of extension of the forearm, with the arm hanging at the side, is directed somewhat away from the axis of the body, so that the elbow can get a purchase against the hip, and objects carried in the hand do not touch the leg; while, on flexion, the hand is carried across the line of the axis of the humerus in the direction of the chest in a manner which has a number of practical advantages. Another point which I have not yet found referred to in any work on surgery, general or special, but which is familiar to observant anatomists is, that the head of the radius, when the forearm is extended, is not in contact with the capitellum—the articular surface of the external condyle of the humerus. Freedom of the motions of pronation and supination is favored by this fact, and at the same time the joint is to a certain extent protected from accident. With the arm extended and the forearm strongly pronated, the head of the radius is at its greatest remove from the capitellum. With the forearm semi-flexed and semi-pronated, the head of the radius rests against the capitellum; while if flexion of the forearm be carried further, there occurs a condition which I have taken this occasion to describe particularly. I do not know that it has been as yet described, although I know that the conclusion to which a study of it has led me coincides with what has been done before; and I have been interested to ascertain, by a correspondence accidentally started, that Dr. H. L. Smith, of Boston, has been brought to similar conclusions by studies undertaken before he knew that I was working on this subject and by actual practice.

The point which I wish to make is, that when the forearm is semi-prone and fully flexed—that is, until flexion is stopped by the impact of the coronoid process against the humerus in the coronoid fossa—the bones of the forearm act as a lock to hold the lower end of the humerus, in case of an intra-condyloid fracture, in a correct anatomical position, and that in no other position of the forearm is this the case. If we take the bones in this position we find that the olecranon and coronoid processes, with the ridge dividing the greater sigmoid cavity, control the inner part of the elbow-joint, preventing motion laterally, antero-posteriorly, or rotary, while the head of the radius rests against the capitellum, and its ligaments prevent displacement of the external condyle in any direction by the condition of tension in which they are found when

the forearm is fully flexed and semi-pronated. To say that the bones of the forearm lock the inner and outer portions of the lower end of the humerus in a correct anatomical position, covers the essential points in the treatment of a fracture; and to understand the full significance of the expression requires only a knowledge of the anatomy of the elbow-joint.

As I wish to be brief, I will limit myself to this statement, adding only a particular reference to the obliquity of the plane of the joint and the danger of rotation of one of the fragments, as alluded to above.

To meet the indications suggested by these anatomical considerations, I apply from the fingers to the shoulder, smoothly and with moderate tension, a soft flannel bandage, avoiding undue pressure upon the anterior angle at the elbow by having the forearm flexed and semi-pronated while the bandage is applied. After this the bend at the elbow is filled with some cotton, a splint is laid against the arm with very moderate cotton padding—not bound on with a bandage, but just laid loosely on—and the whole is enclosed with a good roller bandage. This treatment I have found to be entirely comfortable to the patient, and to give admirable results.

The essential feature of the method which I propose is, that the forearm shall be semi-pronated and fully flexed, with the intention that the ulna and radius shall then hold their corresponding parts of the joint-end of the humerus in a correct anatomical relation to each other. The mode of securing the arm is a detail which need not be discussed here, as any one who treats many elbow-joint injuries knows that it is impossible to fix inflexible rules for their management.

Any splint may be used which will maintain the forearm in full flexion upon the upper arm. For this purpose a splint with a very acute angle, to fit either side of the arm, or an anterior angular splint will answer.

The chief difficulty in following out a theoretically correct method at the elbow-joint is due to the swelling which, in this situation, comes so quickly and often becomes so considerable. My own experience leads me to believe that it is desirable to effect reduction of this swelling by a carefully applied flannel bandage, assisted with wool or cotton, so as to produce equable pressure. This may be for twenty-four hours before applying the splint which is to maintain the arm in the position above referred to; and while it is done the arm may be kept in almost any position that is comfortable to the patient. I find that it requires some ingenuity to neatly bandage an arm to a lateral angular splint, but no more than every surgeon may be supposed to have.

This is not the time to dwell upon details which all surgeons understand. The object of this note is to call attention to the fact, as I believe, that, if the forearm be semi-pronated and fully flexed upon the humerus, the head of the radius and the coronoid and olecranon processes of the ulna will hold the inner and outer portions of the lower end of the humerus in a correct anatomical relation to each other and to the bones of the forearm. With all this, it is possible that a T-fracture may turn out badly; but, if it should, this would be in consequence of a displacement at the line of transverse fracture; and I believe the chances of such an accident would be diminished by securing accurate anatomical relations of the bones forming the elbow-joint.