CLINICAL USES OF VITALLIUM

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SINCE PIONEER SURGEONS began to contrive operations of various types, there has been a keen interest in the use of metallic appliances to aid in supporting tissues. Metal cleft palate plates, bone plates, screws, wire, skull replacements, intestinal anastomosis tubes, cannulae, and many other metallic contrivances have been devised to aid the surgeons in reconstructing some defect in the body. Scores of implements made of nearly every known

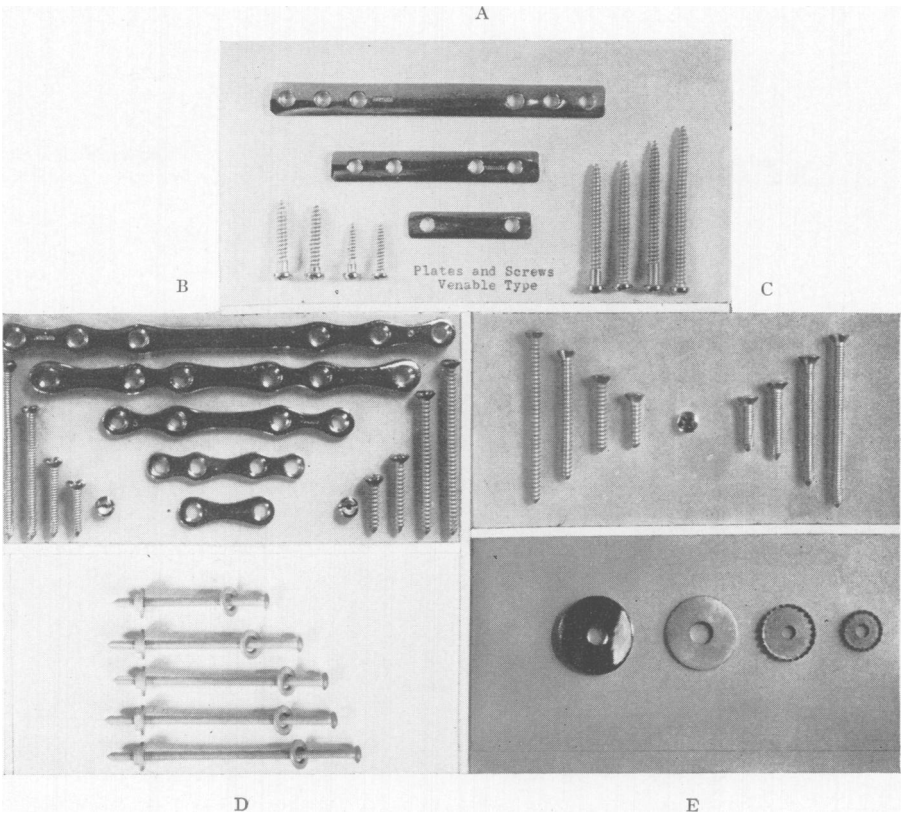

FIG. 1.—(A) Curved metal plates and flat-headed screws of Vitallium designed by Venable for use in bone surgery. (B) Sherman-type plates and machine screws made of Vitallium. (C) Vitallium screws of the wide thread-type, made with Phillips recessed heads, which provide a much firmer grip for the screwdriver. (D) Vitallium bolts devised by Barr for fractures of the tibial plateau. (E) Vitallium washers, prepared to supplement bolts and screws in the fixation of fractures.

metal have been conceived and utilized at one time or another. Nevertheless, in spite of this long search for suitable metal devices for use in surgery, there was slight success and metals came to be discarded because they seemed to be "foreign bodies" that were poorly tolerated by the tissues.

With the introduction of the alloy, Vitallium, into bone surgery in 1936,

we were able to present a metal which was inert in the body fluids and consequently free of any unfavorable tissue reactions. Moreover, we were able to establish the principle that no metal is suitable in the body if it is subject to corrosive change due to chemical or electrolytic action in the tissue

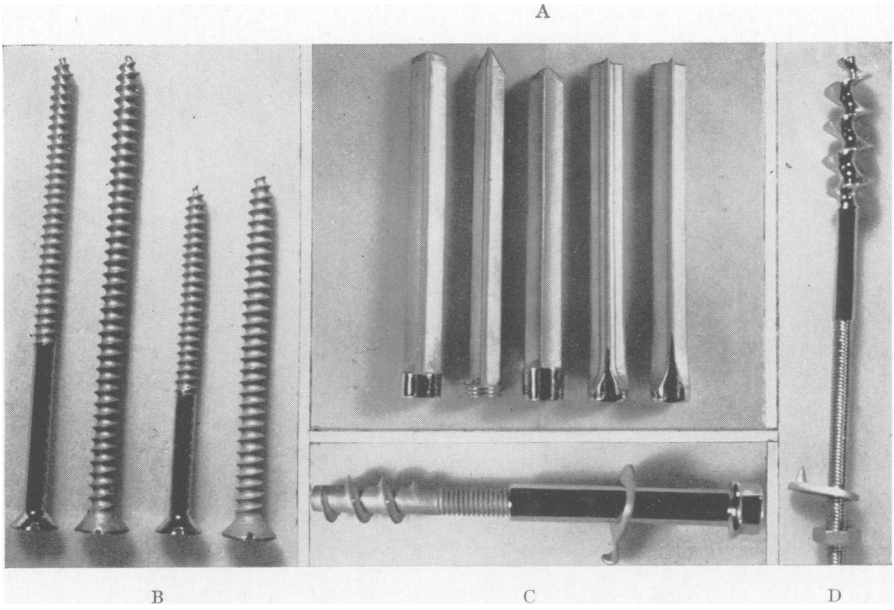

FIG. 2.—(A) Vitallium Smith-Petersen hip nails with various types of head and tips. (B) Venable-type Vitallium hip screws for fractures of the hip, tibial plateau or condyles of the femur. (C) Henderson lag-screw of Vitallium for fractures of the neck of the femur. (D) Lippman cork-screw bolt for hip fractures.

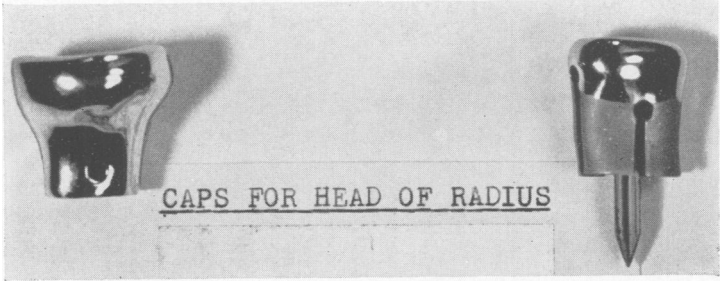

FIG. 3.—Kellogg Speed's Vitallium cap for the head of the radius.

fluids. The recognition of the results of electrolytic action between metals in the body as a cause of failure of metal appliances was a concept which had been suggested previously by others, but discarded by them since it was not clearly understood that corrosion is dependent upon electrolytic action. That electrolytic action accompanied unfavorable tissue reaction, we found to be uniformly true and the elimination of electrolytic action through use of

a metal which resisted chemical effects of body fluids eliminated the usual damage. Our first animal experiments on electrolysis of metals in the body were undertaken in 1935–36, wherein we came upon Vitallium, a dental alloy, which had been developed by the Austenal Laboratories because of its entire corrosive resistance to saliva. After demonstrating that Vitallium was inert or passive in the body fluids of animals, we had plates and screws made to use in human bones. The first clinical case was operated upon in

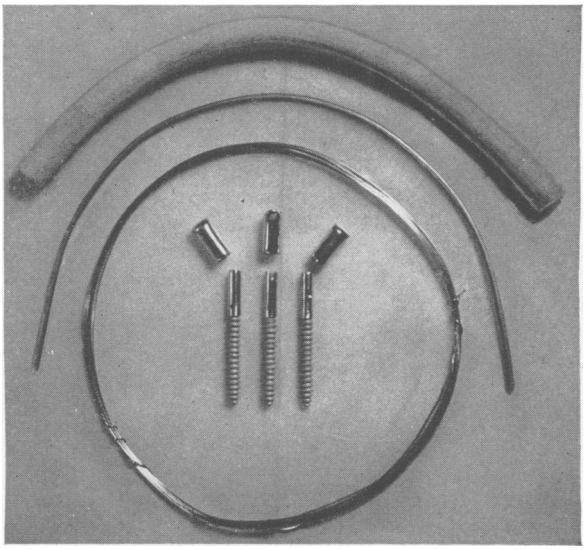

FIG. 4.—Berry's Vitallium screws for fractures of the mandible.

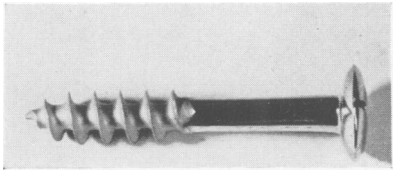

FIG. 5.—Bosworth's Vitallium coraco-clavicular screw.

September, 1936, and since that time hundreds of operations have been performed by many surgeons in which Vitallium appliances have been used. After six years' experience in hundreds of cases, it is now well established that Vitallium is the most inert alloy currently used in surgery. As this record has become known, Vitallium appliances of diverse types have been designed by surgeons in other fields than orthopedic surgery. It is this development which we wish to report to demonstrate the protean utility of

this alloy and its complete tolerance to the various fluids and secretions of the body because of its chemical and electrolytic inertness.

FRACTURES

In traumatic surgery, bolts, screws, and plates of Vitallium have been found to be most useful in repairing fractures which could not be maintained in position by wires, kangaroo tendon, beef bone screws, or other less stable

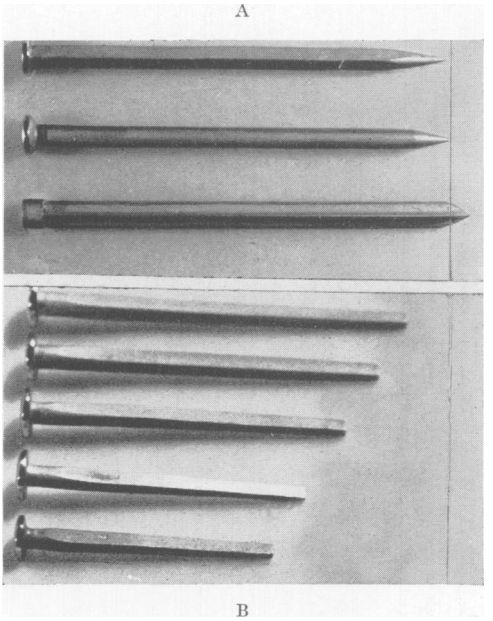

FIG. 6.—(A) Venable-Stuck square nails of Vitallium for arthrodesing joints and to secure condylar fragments in fractures. (B) Vitallium Smith-Petersen arthrodesis pins to stabilize joints after fusion operations.

FIG. 7.—Vitallium replacement of the upper end of the femur, devised by Bohlman and Moore and used after resection for a malignant tumor.

materials. Fractures of long bones, intercondylar fractures into joints, and certain grossly displaced fractures, when replaced and anchored by Vitallium screws and plates have been found to heal more rapidly and with less disability than if treated by appliances of other metals (Fig. 1).

The special problem of fracture of the hip has been nearly solved in recent years by the use of nails, screws, or pins to fasten the head fragment to the neck. This has lead to a much greater prospect of union of the fractures, has eliminated the need for hip spica encasements, has prevented

stiffness of the knee, and has generally given the victims much more comfort and hope of ultimate recovery. These large hip nails and screws often came loose or had to be removed because of unfavorable reactions about them. However, since they have been made of Vitallium, irritation of tissue has been eliminated and the need for the second operation of removal markedly diminished (Fig. 2).

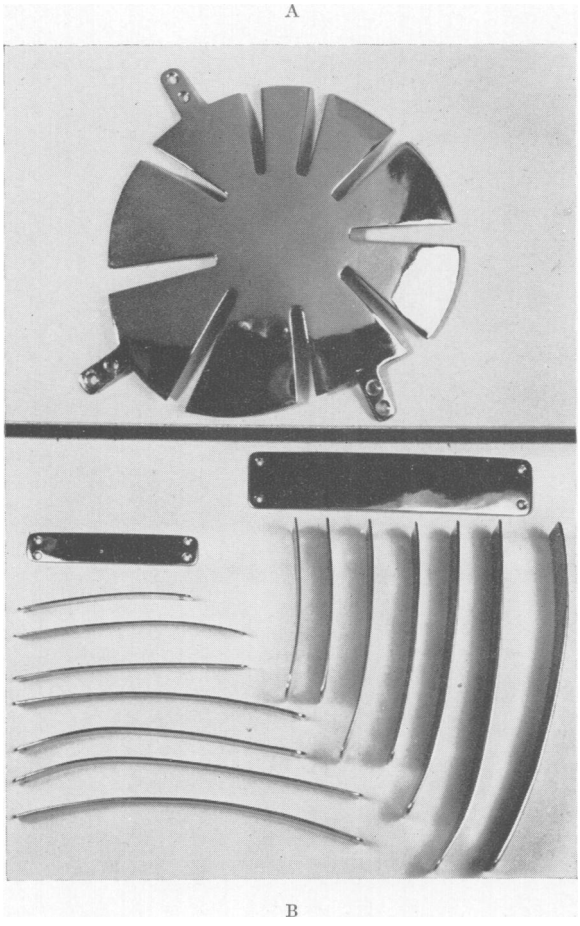

FIG. 8.—(A) Geib-type Vitallium skull plate for the repair of cranial defects. (B) Vitallium strips devised by Claude Beck to cover defects in the skull.

After removal of the head of the radius for comminuted fracture or in arthroplasties of the elbow, a Vitallium radial cap, designed by Kellogg Speed, has been found to facilitate motion and prevent excess new bone formation (Fig. 3).

In fractures of the jaw, Berry has devised Vitallium screws which are anchored in the fragments to support them in the correct position during healing and to prevent displacement (Fig. 4).

For acromioclavicular separations where the ligaments are severely lacerated, Bosworth's screw of Vitallium has been found to be useful in fastening the end of the clavicle to the scapula (Fig. 5).

For the reattachment of small fracture fragments or to anchor joints after arthrodesing operations, several types of round, square, and flanged nails of Vitallium have been devised to aid in the operation (Fig. 6).

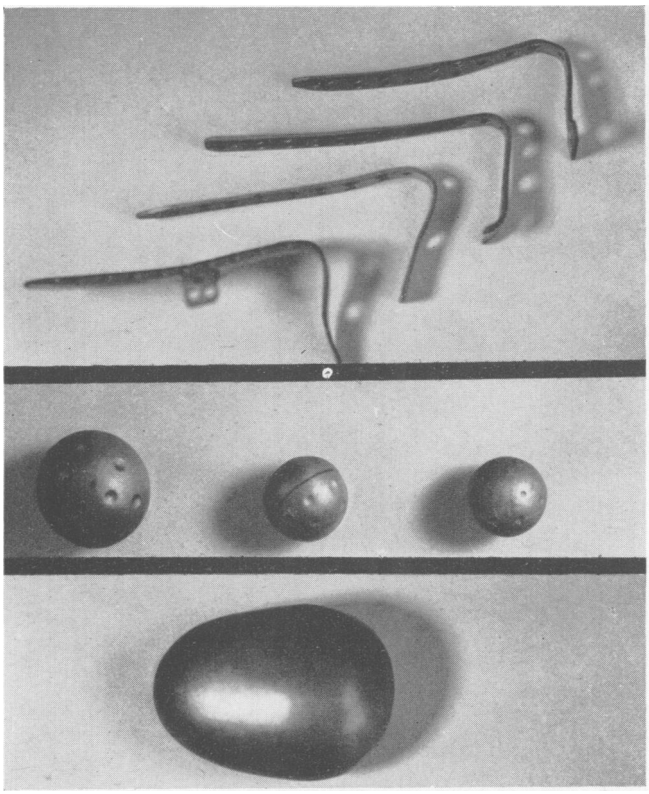

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 9.—Kimball's Vitallium nasal skeletal supports for the repair of "saddle nose" deformity.
FIG. 10.—Doherty's Vitallium orbital implants.
FIG. 11.—Bowers' Vitallium testicle replacement.

TISSUE REPLACEMENT

The most spectacular use of a Vitallium appliance to replace lost tissue was Bohlman and Moore's metal head and neck of the femur. After the entire upper end of the femur had been resected for a malignant tumor, a Vitallium replacement was inserted which functioned normally. The patient was thereby given a strong, stable, painless hip on which he walked for several years (Fig. 7).

For defects of the skull, Vitallium plates serve as dependable, comfortable protectors of the adjacent soft tissues without the usual headaches (to surgeon

and patient) and irritation that follow most other replacements. Geib devised a plate which was modeled to fit the defect under consideration, while Claude Beck developed various sizes of Vitallium strips which could be used without preliminary preparation (Fig. 8).

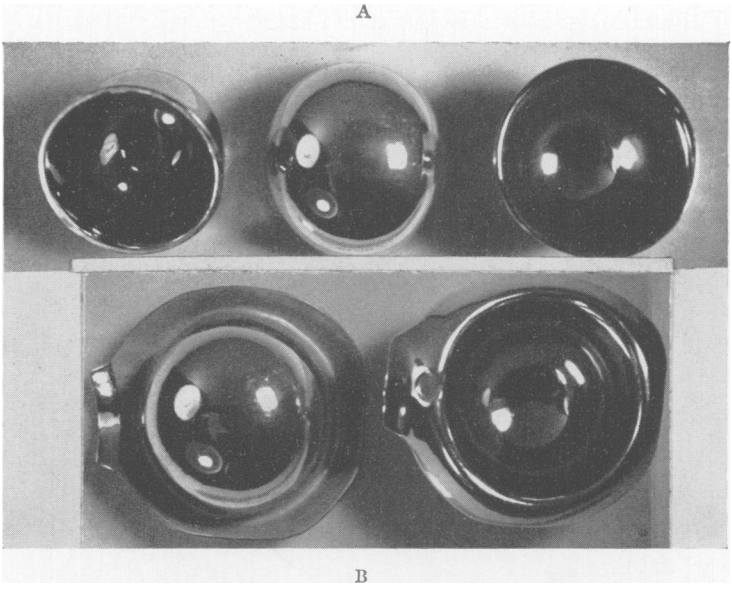

FIG. 12.—(A) Smith-Petersen Vitallium hip caps for repair of ankylosed joints or those in which there has been much destruction of the joint surface. (B) Albee-Preston Vitallium hip sockets for arthroplasty of the hip.

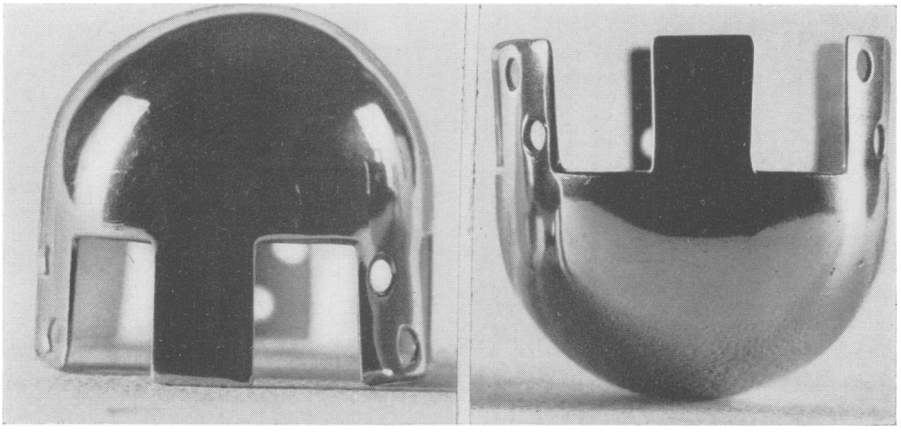

FIG. 12(C).—Venable-type hip cap which is secured by flanges and screws to the neck of the femur.

The bridge of the nose often loses its bony support after osteomyelitis or congenital lues, which results in the classical "saddle nose" deformity. During plastic operations to repair the defect, a Vitallium support has been

used to restore the normal contour while holding the external skin in position (Fig. 9).

After enucleation of the eye, some implant is needed to preserve the skin folds and provide a foundation for an artificial eye. Many materials have been utilized, though Doherty feels that the Vitallium replacement is more comfortable and secure than any of the previous appliances (Fig. 10).

FIG. 13.

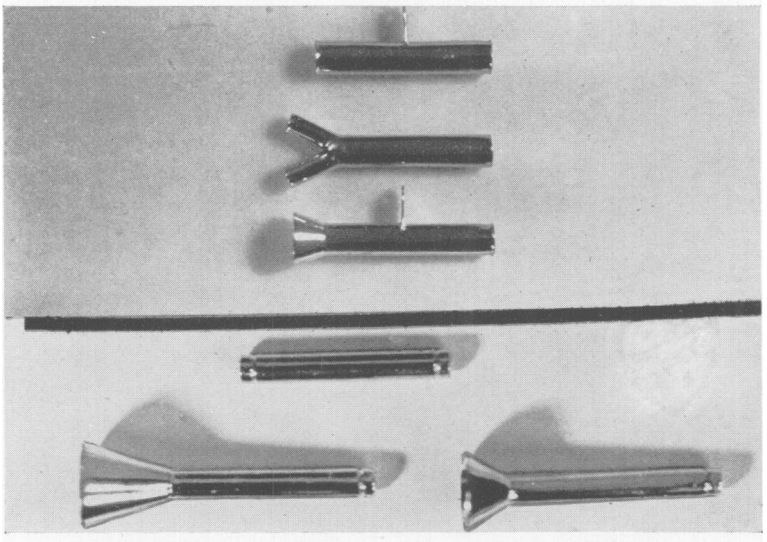

FIG. 14.

FIG. 13.—Pearse Vitallium tubes for repair of the bile ducts.
FIG. 14.—Lord's Vitallium tubes for repair of strictures of the ureter.

FIG. 15.—Smith's colostomy plug of Vitallium to be worn externally over a colostomy stoma.

When the testicle is removed for any reason, it is desirable to replace the defect to overcome unsatisfactory psychologic reactions. Vitallium implants have been found most satisfactory since they are light in weight and nonirritating, though patients notice that they are cold (Fig. 11).

ARTHROPLASTY OF JOINTS

The problem of restoring motion to ankylosed joints has occupied the attention of surgeons for many years. Pieces of fascia lata, pig bladder, and fat, have been used with varying degrees of success as an interposing material. Since the introduction of Vitallium, metal appliances have been used to line the hip, knee, elbow, and finger joints. The most successful of these metal joints is the hip, because this joint is more simple mechanically and is better suited to such reconstructive procedures. Venable devised a fixed type of Vitallium hip cap, while Smith-Petersen has advocated the free floating type (Fig. 12).

BILE DUCT TUBES

Pearse and Clute have devised Vitallium tubes to place in the bile ducts for the repair of strictures or to replace irreparable damage to the ducts. This is the first material which has been found that will resist the action of bile and still cause no irritation to the adjacent soft tissues. The success of these bile tubes has opened new vistas in the surgical replacement or repair of damaged digestive or excretory organs (Fig 13).

URETER TUBES

The problem or repairing or replacing portions of a ureter requires that a tube will maintain its normal lumen without any incrustation and be free of any other irritative phenomena. Vitallium tubes have been used successfully for this purpose as well as for the maintenance of permanent suprapubic cystotomies (Fig. 14).

COLOSTOMY PLUG

While a colostomy plug is not an application of metal within the body, still, it necessitates a material which will resist the intestinal contents and at the same time rest against the abdominal wall without causing irritation of the skin. Smith's colostomy plug of Vitallium seems to meet all these requirements and to be far superior to any other materials which have been used heretofore (Fig. 15).

SUMMARY

It has been more than six years since we demonstrated the effects of electrolysis of metals in the body and introduced the inert alloy, Vitallium, into surgery. During this time, many uses have been found for Vitallium where a passive metal appliance was desired. While there are numerous devices which have been made of Vitallium that have not yet been reported by their sponsors, we are presenting some of those which are better known to show the wide range of usefulness of this metal. In many of these locations, no metal has previously been available which could be used with success because of harmful electrolytic effects.

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