

1

3,326,213

THERAPEUTIC DRESSING MATERIAL AND METHOD OF USING THE SAME

John P. Gallagher, 2415 Foxhall Road, NW.,

Washington, D.C. 20007

No Drawing, Filed July 9, 1964, Ser. No. 381,562

6 Claims. (Cl. 128—156)

This invention relates to a novel medical and surgical dressing material and method of using the same for the treatment of damaged mammalian tissues.

I have found that fine gold, in leaf or foil form when electrostatically charged, has a number of beneficial effects in surgery and medicine. It is highly effective as a hemostatic material in arresting hemorrhage from arterial, venous and capillary sources. It is useful in the treatment of burned surfaces on the body both fresh and otherwise. It may be used to close openings in hollow and solid organs of the gastrointestinal and genito-urinary tracts, such as the stomach, intestines, bile duct, liver, kidney, pelvis of the kidney, ureter and bladder. It can also be used to seal holes in the skull and other bones, to cover wounds of the brain to protect the sites of anastomosis of nerve trunks and of blood vessels, and to seal holes and openings in the membranes of the brain and spinal cord, such as the dura and the arachnoid. It is also useful in the treatment of disorders of the skin such as chronic ulcerations, acne and in the treatment of wounds of various sizes.

In the application of the gold leaf an electrical charge is conferred on the leaf, for example, by stroking a camel hair or other mammalian hair brush against a hard rubber comb and then touching the leaf with the charged brush. The gold leaf clings to the brush and can be directly implanted from the brush upon the tissue surface or area to be treated. When the charged leaf is touched to the surface it is released immediately from the brush and clings securely to the tissue surface. Electrically charged beaten gold in foil or leaf form displays a unique ability to cling to the body tissues and remains closely adhered to any irregular contours of the surface on which it has been placed. Since fine gold is almost inert chemically adverse tissue reactions are almost nil.

The term "fine gold" is used herein to designate gold of about 23 karats or more of fineness or purity.

Although fine gold leaf in the form typically supplied in booklets for decorative gilding and having a thickness of the order of 0.0003 to 0.0004 mil can be used for the purposes of the invention, leaf of somewhat greater thicknesses in the range of about 0.001 mil to about 0.01 mil is preferred and for some applications leaf or foil of a thickness up to about 0.1 mil are useful.

While solid sheets of gold leaf are useful in most surgical or medical applications, it may if desired be applied in perforated form or with a cloth or plastic or an adhesive backing. The backing may be medicated.

Experimental tests on animals have established the usefulness of the material and methods described above. Effective procedures will be described by way of example with reference to a series of tests with rabbits which animal has systemic arterial blood pressures approximating those found in man.

Commercially available gold leaf of 23 karat gold as supplied in booklets for decorative purposes were used in the tests and the pieces of leaf were charged as used by means of sterilized camel hair brushes and a hard rubber comb as described above.

Rabbits weighing between 1.5 kg. and 2.0 kg. were utilized. In all cases the abdominal aorta and the inferior vena cava were exposed through a long midline abdominal incision under intravenous barbiturate (Nembutal)

2

anesthesia. Direct access to both vessels was made by incision of the posterior parietal peritoneum from a point just above the renal vein and artery and extending down to the iliacs. The abdominal aorta was wounded by piercing it with a straight cutting edged surgical needle. The induced wound was always great enough to produce jets of arterial blood from two inches to twenty-four inches in height. In some animals the aorta was wounded in situ and in others the aorta was held up from its bed by a surgical clamp and then wounded. In most of the animals only one aortic wound was made. In the others, two aortic wounds were made. The inferior vena cava was wounded in a similar fashion. In many cases, larger wounds of the vena cava were made by passing the cutting edged needle into the lumen of the vein obliquely and then removing it with a tearing motion.

After making the aortic wound the opening in the vessel was then covered with a charged piece of gold leaf about 1 cm. square. In the case of small jets of blood, two or three pieces of leaf were necessary to produce complete hemostasis. With large jets, five or six pieces of leaf, laid one on top of the other were necessary for absolute hemostasis. Hemorrhage from wounds of the inferior vena cava could be arrested using only one or two pieces of charged gold leaf. In all cases, both with aortic and caval wounds the field had to be kept clear of pools of blood, otherwise the leaf could not gain firm contact for closure. If the field was flooded with blood, the piece of gold floated away from the implantation site. However, it was found that the gold leaf adheres well to moist surfaces and that it is not necessary to completely dry the target area. After hemostasis had been achieved in each large vessel, the abdominal wall was closed in routine fashion with continuous black silk sutures for the deep and superficial layers.

The efficiency of charged gold leaf in controlling capillary hemorrhage was tested in a number of these animals. The ears of several rabbits were closely shaved and the shaven surfaces were abraded with a carpenter's rasp. After brisk capillary bleeding was started, the charged leaf was then applied to the raw surfaces for hemostasis. All of the animals used in this series received 200,000 units of penicillin at the end of surgery.

The sites of gold implantation on the aorta, inferior vena cava, and the sites of capillary bleeding on the rabbit ears were examined at various intervals after surgery. In no case, including animals under observation for as long as 45 days after injury, did postoperative hemorrhage occur from any of the vascular wound sites. In all cases the gold leaf was found to be securely in place with no gross signs of adverse tissue to the metal. The abdominal aorta and the inferior vena cava were removed en bloc from each animal for pathologic study.

The arterial blood pressures have been measured in all of the common laboratory animals and in all of them the systolic and diastolic levels approach that noted in the normal human. The pressures measured in the inferior vena cava range between 4 and 5 mm. mercury. The diameter of the rabbit abdominal aorta is about 1.75 mm. and the inferior vena cava about 3.0 mm. The wounds made in the aorta in the experiments described above were about 0.5 mm. or about 25% of the diameter of the vessel. The wounds made in the vena cava were at least 0.5 mm. or 33% of the vessel's diameter.

I claim:

1. A therapeutic dressing material comprising beaten fine gold leaf having an electrical charge to adapt it to cling to body tissue and having a thickness in the range of from about 0.0003 mil to about 0.1 mil.

2. A therapeutic dressing material comprising beaten fine gold leaf having an electrical charge to adapt it to

3

cling to body tissue and having a thickness in the range of from about 0.001 mil to about 0.01 mil.

3. A method of treating damaged mammalian tissue which comprises electrically charging beaten fine gold leaf having a thickness of from about 0.0003 mil to about 0.1 mil and applying the electrically charged gold leaf to the damaged tissue. 5

4. A method of arresting hemorrhage in mammals which comprises electrically charging beaten fine gold leaf having a thickness of from about 0.0003 mil to about 0.1 mil and applying the electrically charged gold leaf to the hemorrhaging tissue. 10

5. A therapeutic dressing material comprising fine gold leaf having a thickness in the range of from about 0.0003 mil to about 0.1 mil and a backing for said fine gold. 15

4

6. The invention defined in claim 5 wherein the backing comprises plastic and the therapeutic dressing material is perforated.

References Cited

UNITED STATES PATENTS

3,191,303 6/1965 Baum 32—15

OTHER REFERENCES

Gold Prevents Adhesion, Science News Letter, October 3, 1964.

Medics Back to Gold Treatment for Arthritis, Science News Letter, February 21, 1959, page 119; copy in 167-68D.

15 ADELE M. EAGER, *Primary Examiner*.