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(54) Titre : AGENT PHOTOCHIMIQUE UTILISABLE COMME COLLE
(54) Title: PHOTOCHEMICAL AGENT FOR USE AS A GLUE

(57) Abrégé/Abstract:
A physiologically suitable, non-toxic photochemical agent for use as a glue to bind a synthetic material to tissue and tissue to tissue is disclosed wherein the agent is activated by exposure to electromagnetic radiation.

ABSTRACT OF THE DISCLOSURE

A physiologically suitable, non-toxic photochemical agent for use as a glue to bind a synthetic material to tissue and tissue to tissue is disclosed wherein the agent is activated by exposure to electromagnetic radiation.

PHOTOCHEMICAL AGENT FOR USE AS A GLUE

FIELD OF THE INVENTION:

This invention relates to the use of a physiologically suitable, non-toxic photochemical agent as a glue to bind a synthetic material to living tissue and tissue to tissue, wherein said agent is activated by electromagnetic radiation.

BACKGROUND OF THE INVENTION:

Means of attachment of a synthetic material such as a patch or the like to living tissue or of tissue to tissue have included use of sutures, staples and the like as well as various glues, many of which are heat activated. By way of example, collagen has been used as a heat activated glue, the thermal bonding occurring with the denaturation of the collagen when it is exposed to heat. The applicability of thermal bonding is however limited. It is not applicable to the vascular system due to the weak strength of the solder and the risk of dehiscence post-surgery.

SUMMARY OF THE INVENTION:

In one broad embodiment, the invention relates to a physiologically suitable, non-toxic photochemical agent for use as a glue to bind a synthetic material to living tissue and tissue to tissue, wherein the agent is activated by exposure to electromagnetic radiation. In a preferred embodiment, the agent is activated by exposure to electromagnetic radiation in a range of about 647 to 700 nm.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

During surgery and particularly during minimally invasive pediatric cardiac surgery, there is a need for the use of a biological glue which is activated by exposure to electromagnetic radiation. The present invention is based on the unexpected discovery that photochemical agents which are activated by exposure to electromagnetic radiation can be used to bind living tissue to synthetic material as well as tissue to tissue.

There are many photochemical agents available. The agent chosen depends on the application to which it is put. The agent selected has of course to be physiologically suitable and non-toxic. If the photochemical agent is activated by electromagnetic radiation in the blue range (424 to 491 nm), tissue penetration of a depth of 1 mm occurs. The advantages involved with the use of radiation in this range is that the photochemical agent can be activated using a flexible light wand. Using light in the green range (491 nm to 575 nm), one can effect tissue penetration at a depth of 2 to 3 mm. The use of a photochemical agent activated by electromagnetic radiation in the blue and green light range would have applications in fields other than vascular surgery. In the vascular system, a greater depth of penetration is necessary. Tissue depth is critical within the vascular system/intracardiac repairs and an agent which is activated by electromagnetic radiation in the red range (647 to 700 nm) should be used in such a system. The depth of penetration is then approximately 5 to 7 mm.

An example of a suitable agent is naphthalin, $C_{10}H_8$, having a molecular weight of 128.17. Naphthalin is activated by electromagnetic radiation in the range of 647 to 700 nm.

By way of example, during the course of surgery, a synthetic Dacron* patch is adhered to the heart muscle to close a hole in the heart without the need for sutures and/or staples by impregnating the said patch with a solution of naphtalin. The patch is then placed in position and held while being subjected to electromagnetic radiation in the 647 to 700 nm range by means of a photon emitting light source which is brought into proximity.

* Trade-mark

The use of photochemical agents which are activated by electromagnetic radiation in the range of 640 to 700 nm has been found to be ideal for valve implantation and closure of holes within the heart, either congenital or acquired. Such procedures can be performed in a minimally invasive manner and with less ischemic time to the myocardium. The photochemical welding can be performed both accurately and without the spillage of any agents, a potential source of embolization, as could be the case with a regular glue, and quickly thus reducing the inflammatory reaction of cardiopulmonary bypass.

Those skilled in the art will appreciate the described embodiment, while preferred, can be modified to a greater or lesser degree. I therefore wish to embody within the scope of the patent which may be granted hereon all such embodiments as reasonably and properly come within the scope of my contribution to the art.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Use of naphthalene as a glue to bind a synthetic material to a tissue wherein the naphthalene is activated by exposure to electromagnetic radiation.

2. Use of naphthalene as a glue to bind a first tissue to a second tissue wherein the naphthalene is activated by exposure to electromagnetic radiation.

3. The use of claim 1 or claim 2 wherein the naphthalene is activated by exposure to electromagnetic radiation in a range of 424 to 491 nm.

4. The use of claim 1 or claim 2 wherein the naphthalene is activated by exposure to electromagnetic radiation in a range of 491 to 575 nm.

5. The use of claim 1 or claim 2 wherein the naphthalene is activated by exposure to electromagnetic radiation in a range of 647 to 700 nm.