OPHTHALMIC SURGERY SIMULATION DEVICE

This application claims the benefit of priority under 35 U.S.C. §119(e) to U.S. provisional application Ser. No. 60/534,961 filed Jan. 9, 2004.

I. FIELD OF THE INVENTION

The present invention relates to devices for simulating ophthalmic surgery conditions and methods of using the same. More particularly, the present invention relates to prosthetic devices for simulating the conditions of the eye of a live human or other animal for purposes of practicing ophthalmologic surgery techniques.

II. BACKGROUND OF THE INVENTION

As will be appreciate, the margin of error during surgery is miniscule. This is particularly true with eye surgery. The eye is a small and complicated organ that is very delicate and sensitive on which to operate. The slightest error could permanently damage the eye and result in impaired vision or blindness. To avoid surgical mishaps, the training of surgeons, including ophthalmic surgeons, is a multi-year, rigorous regime of study and practice. The development and honing of the necessary surgical skills and expertise requires hands on training and practice in life-like settings.

Certain types of surgery readily lend themselves to practice on cadavers or animal models. For example, practicing incisions in the torso to avoid piercing critical organs or practicing the suturing of tissues, may be accomplished on cadavers, animal models, or the like. Surgical students showing promise with these skills may then begin to develop greater dexterity and precision by practicing their incision and suturing techniques on live patients needing treatment in areas and under conditions where the patient's life and well being is not at risk. As techniques are mastered, students progress to more complicated and delicate procedures until they reach a point of being aptly trained to perform as highly-skilled surgeons.

As will be appreciated, ophthalmology is one area of practice that is somewhat ill-suited for cadaver and animal-based training. Also, the eye is a particularly delicate organ on which to allow an untrained hand to operate. Accordingly, the clinical hands-on training with live patients applicable in many surgical areas is not particularly palpable with eye surgery. Some of the difficulties associated with practicing surgical techniques on the eye is based on the anatomical differences in animal and human eyes and the inability to simulate the conditions of the eye in a living patient with a cadaver. For example, the way an eye is held and reacts in the socket of a living human is very different from that of a cadaver.

Even putting the drawbacks of cadaver training aside, the human eye is a transplantable organ in great demand and limited availability. In today's climate, the gift of sight is given to many in need through transplantation. Indeed, human corneas are now routinely transplanted to save the sight of many older Americans. The ever increasing need of putting transplantable organs to their highest and best use leads to fewer human eyes available for surgical practice by promising surgeons, while creating a greater demand for surgeons capable of performing the delicate harversting and transplantation procedures.

There are two current techniques for practicing ocular surgical procedures and anterior segment surgery. The first involves the use of an animal or cadaver eyeball placed in a socket of a Styrofoam replicate of a human head. With this technique, a life-sized replicate of a human head is provided having an eye socket mimicking the contours, depth and features of an actual human eye socket. An animal or cadaver eye is placed in the socket and pinned or sutured in the socket to hinder movement of the eye during practice. However, as will be appreciated, one drawback of this method is that it does not provide enough stability to hold the eye in place during complex suturing exercises, or during the use of phacoemulsification machines, or other techniques which place significant pressure and torsion on the eye.

The second technique uses a flat platform plastic suction device. These devices use a suction ring set in a plastic base that is attached by tubing to a large syringe. Suction is applied to an eyeball placed in the ring by withdrawing the syringe plunger and clamping the connected tubing when sufficient vacuum is achieved. While the devices are capable of holding an eyeball securely in place, this technique provides only a static degree of vacuum that is difficult to change during surgical exercises. Moreover, as will be appreciated, another disadvantage of flat platform suction devices is that they share no similar anatomic features to the human head and are thus of limited utility in training.

Accordingly, there exists a long-felt, yet unresolved need for an improved device and method for practicing ophthalmic surgical techniques. Moreover, there exists a need in the art for a device capable of simulating more life-like conditions for practicing ophthalmic surgical techniques.

III. SUMMARY OF THE INVENTION

The present invention overcomes the serious practical problems described above and offers new advantages as well. One object of the invention is to provide an improved means for practicing ophthalmic surgical techniques. Another object of the invention is to provide a device for simulating life-like eye conditions for practicing surgical conditions on cadaver or animal eyes. These and other objects, aspects and features of the invention may be realized by the provision of a prosthetic head having an eye socket for receiving and retaining an eyeball.

According to one aspect of the invention, the prosthetic head comprises a Styrofoam head customarily used for displaying wigs. In an alternate embodiment, the prosthetic head comprises a mannequin or like synthetic head. In another embodiment, the prosthetic head comprises a trauma mannequin. According to the invention, an advantageous feature of the invention is the provision of an eye socket(s) in the prosthetic head adapted to receive an eye. In one embodiment the socket is configured to hold an eye, either animal or cadaver, in a manner similar to the human head.

Another advantageous feature of the invention is the coupling of the eye socket with a means for creating suction pressure to hold the eye in the socket. In one embodiment of the invention, the suction means comprises fluid-tight tubing in communication with the socket. According to this embodiment, the tubing is adapted to be couplable to a means for creating negative pressure in the socket. In an alternate embodiment, the suction means is integral with the tubing. Preferably, the socket is sized in the back to allow an eye to be held in the socket in an orientation and depth similar to the human skull while sealing an opening in communication with said tubing. According to another embodiment, the eye socket is provided with an insert. The insert is preferably removable and used to position smaller