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Biomaterials as a tool for teaching and learning training programs on surgery

Avelina Sotres Vega, Jaime Villalba Caloca and Alfredo Santibañez-Salgado

National Institute of Respiratory Diseases, Mexico

Statement of the Problem: Developing surgical skills is essential in the training of all surgical specialties. However ethical, legal and economic issues have limited surgical training. As surgical educators, we are always trying to identify new ways to provide skills training. We have developed training programs to teach surgical skills to junior surgeons from human and veterinary medicine based on laboratory animals using preserved tissues and organs as surgical training biomaterials. The goal is to help the trainees acquire the abilities and dexterity necessary to perform surgery on patients.

Methodology: We created a small bank of cryopreserved tracheas and stomachs harvested from Wistar rats as well as cryopreserved tracheas and lyophilized esophagus that were harvested from dogs. All animals were previously used in research studies. Stomachs, tracheas and esophagus were cleansed with saline solution, after which, tracheas and esophagus were mounted on polypropylene tubes. In the stomachs the pyloric antrum was tied with silk 1-0, stomachs were filled with hyaluronic acid solution and the distal esophagus was tied too. Tracheas and esophagus were trimmed in segments of 5 cm. Cryopreservation of tracheas and stomachs was made with a controlled-rate freezer (-1°C/min) and stored at -30°C for 30 to 60 days. The entire esophagus was lyophilized at -55°C and 10 mBar of vacuum pressure during 24 hours and sterilized with low temperature hydrogen peroxide gas plasma process. On the day of the surgical skills practice the cryopreserved organs were thawed at room temperature and the all the esophagus were rehydrated with saline solution at 4°C. Each preserved organ was used to perform end-to-end anastomosis with 4-0 running polypropylene or single stitches. Preserved organs are high-fidelity, inexpensive, practical, portable bench models that improve the tactile perception and facilitate surgical skills learning by improving how trainees handle tissue and surgical instruments.

avelinasotres@gmail.com