Educational Program on Oral Microsurgery

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Keywords: Microsurgery; Microscope; Microscopic surgery

1. Introduction

Microsurgery is a set of surgical techniques that use the magnification of the surgical field through optical instruments that allow surgeons to access to organic microstructures to solve pathologies with very little tissue damage and promoting better repair tissues. In the late nineteenth century some works appeared from the hand of Hirstch (1881) and Jaboulay (1898) on vascular surgery with anastomosis or vascular transplantation on monkeys and dogs with the use of Surgery Microscope [1,2,3]. Later, in 1912, Alexis Carrel was awarded with the Nobel Prize in Medicine for his work on vascular suture transplantation of blood vessels and organs with the use of this tool [2,3].

In dentistry, the surgical microscope has proved to be a very important tool. The first use of dental microscope was in 1949 with Van Leeuwen, who used a Greenough microscope for periodontic studies. From then until now, the surgical microscope has taken much relevance in this specialty, being a tool that significantly increases the success of interventions, both for Surgery, Periodontics and Restorative Dentistry[1,2,4].

2. Educational Program

Nowadays the introduction of the microscope in precision dental practice is one of the most significant developments that have occurred in modern dentistry being now the biggest challenge to get these advances to new generations of dentists that are in formation, and ensure that those with more years of practice come to get the right skills and to increase the quality of dental care skills [1,3,4,5,6].

Professionals who are introduced in this new technology in a sequential way, through learning workshops and notarized by a method of teaching, efficient, orderly, to report a curve faster and easier learning within a relaxed working environment [1,2,6,7,8].

In Dental Surgical Educational Programs should be reserved a section to bring this technology and develop the necessary skills to use it among professionals. This training should be staggered by the level of preparation of students by setting different goals [1,2,6,9,10].

Appropriate levels have to be established for the correct learning of the student, to achieve a progress in the knowledge and skill sequentially.

3. First Level

The First Level goals are to achieve a proper postural and tremor control to start using the Surgical Microscope.

3.1 Postural Control in the Use of Surgical Microscope

The purpose is to learn how to adjust the position of the patient and the microscope for the surgeon and assistant to be in the most comfortable positions and to produce less fatigue and tiredness [1,6]. The correct position constraint operator is (Fig.1):

- Position of the head and neck: it is essential to emphasize the importance of keeping your eyes on the binoculars and work with a neck angle of approximately 30°; if we force this angle, an increase of musculoskeletal stress reduces the yield of the surgeon. It is important to have perfectly aligned the microscope and the vertical axis forming by the neck and head, thus preventing cervical vertebrae rotation.
- Position of the forearms, back and lumbar support: the forearms should be settled on the table. Keep your back straight and a correct lumbar support in the seat, this provides the stability necessary to perform these procedures with maximum precision.
- Position of the feet: a good feet support in the chair or on the floor procures the necessary stability.
- Hand position and the instrumental grip: This is essential in the use of the microscope. The material must be handled with harmony and precision of movement, to control the tremor instrumental must be supported in the hand thenar depression and in the middle finger, this leads to greater accuracy when working at high magnifications.
3.2 Tremor Control in the Use of Surgical Microscope

Control of tremor is one of the most important preliminary steps in the learning period of the Surgical Microscope Use. The Surgical procedures are measured in tenths of a millimeter when we work at high magnifications; therefore the tremor is not possible if surgeons want to carry out interventions with Microscope[1,2,3,6,8].

The threshold of patience has to be very high and it should be trained by metalizing, physical training and technical preparation.

Basic guidelines for the control of tremor:

- Avoid feeling of despair and futility. Do not be discouraged, breathe deeply and relax.
- Forget irritation and temper.
- Do not try to go fast. Make a step well before taking the next. If a problem appears, stop and think.
- Feel confident and be focused.
- Avoid sleep deprivation and heavy physical effort.
- Avoid tobacco, coffee, alcohol and other bad influences.
- No work long hours with the Microscope.
- Proper position and good support for handling and maneuverability.

3.3 Exercises to be performed at this level

Students must perform simple exercises at this level to get used to the position and the control of tremor with surgical material at high magnifications carrying out the cut of Times New Roman 11 letters in less than 10 minutes [1,6] (Fig. 2).

A study was carried out in the University of Seville, in which three groups were compared. The first one was a group of students with theoretical and practical formation on microscope, students with theoretical formation constituted the second group and in the third group of the study there were students with no theoretical or practical formation.

The time was registered and area of the letter and the exterior zone were measured with a computer software. The group with practical and theoretical formation had better results in all the parameters, followed by the group with theoretical formation. The group with no formation had the worst results in all the parameters.
4. Second Level

In a second step, the students must perform different sutures on synthetic materials for the beginning on training in the surgical field and the management of microscope instrument and suture material.

4.1 Suture in Polyurethane Sheet

To learn the management of surgical instruments and suture with Microscope, students must perform sutures on polyurethane sheets. These plates are made of a fixed plastic base in which a polyurethane sheet is placed. These sheets are thin and fragile [1,6].

Students must carry out on these films incisions and different sutures with a 6/0 microsuture, they should start with simple points and go progressively increasing the difficulty (Fig.3).

The fragility of the polyurethane sheet enables the student to learn to tie the suture with a delicate touch, since it is easy to tear. In this way, it is possible to begin to develop the touch necessary to perform microscopic sutures, with which is easy to cause dehiscences due to the small size of the suture as well as the fragility of the oral tissues [1,4,6].

4.2 Suture in Organic Material

Once it is achieved the need feeling to do correct sutures with Microscope in the in Polyurethane Sheet, students must learnt the suture in Organic Material to managed a soft touch more approximated to the real oral tissue or to enable to get the next level, in which they must work in live animals [1,2,6,7].

Students must carry out an incision over chicken necks, lamb heads or fresh sausages and closing these with sutures, which have been learned in the previous level (Fig.4).
5. Third Level

In this level, students are prepared to take a Microsurgery course. The objective of this course is to acquire the knowledge and skills needed to perform neurovascular microsurgery in human oral pathology. It is divided in two parts [1,6]:

5.1 Oral surgeries on cadavers

Students have to do different Oral Surgery on cadavers. This model permits to learn the real felling of the human tissue before doing surgeries on our patients.

In this level students learn to do a complete Oral Surgery with the use of the Microscope. They have to start with the incision, the flap detachment, the surgery chosen and after that the suture with the help of the Microscope.

The goals of this level is understand and perform the technique of free gingival graft technique and connective tissue graft in the human model.

5.2 Vascular Surgery on Experimental Animals

This part of the course consists on carrying out a vascular surgery in a live rat under general anesthesia [1,6]. This procedure involves a microvascular anastomosis in vessels of 1.0 mm of diameter, which has to be performed in less than 45 minutes. In the end of this procedure the irrigation of the artery is restored and it is necessary to obtain a 90% patency recovered the rat alive (Fig. 5 and 6).
The surgeon in training must spend 15 hours in the laboratory of experimental surgery practicing and familiarizing themselves with the use of the operating microscope, microsurgical instruments and sutures before taking this course [1,6].

Fig. 6  Vascular Surgery on a rat. a) Student working on the rat. b) Incision on the neck. c) Suture of the vessel. d) Satisfactory restoration of the irrigation.

The goals of this level are:
- Learning the cervical and sciatic surgical approach in the rat.
- Knowing the types of nervous microsuture.
- Understand and perform end-to-end nerve suture.
- Learn the art of the arterial vascular microsuture with interrupted sutures
- Understand and perform the arterial-to-end suture with interrupted sutures.
- Learn the technique of free gingival graft technique connective tissue graft.

In this Surgery Course are evaluated different important, such as students, teachers, teaching resources, installations, etc. To do this, different tools are used:
- Student satisfaction survey
- Teacher satisfaction survey
- Evaluation of students to / the teacher / s
- Evaluation of teachers by students

A student assistance control is carried out with a register of signatures each day (compulsory attendance: 80% of the hours).

Satisfaction results after 5 years of completion of the course are:
- Items relating to the content and duration of the training have been rated very positively. 100% of students have qualified both items as “Adequate” or “Very adequate”. 88% of the students think that the adaptation of content to course objectives is “Very adequate”.
- Although the theoretical and the practical sessions were rated as “Adequate” or “Very adequate” for 100% of the students, the Practical Workshops have had a better assessment ("Very Adequate" 100% in the practical workshops compared to 38% in theoretical sessions).

6. Fourth Level

Finally, students complete the Educational Program performing oral surgery interventions on patients with microscope to perfect the technique. At this level, students will learn concepts such as positioning the patient for surgery assisted by...
microscope and the management of oral human living tissue, obtaining a better quality of surgical treatment [1,2,4,6,7,10].

It is absolutely impossible to establish all the work positions that we may need to perform microsurgical procedures in different areas of the oral cavity, therefore the ultimate goal is to learn how to adjust the position of the patient and the microscope for the surgeon and the assistant. A correct position is achieved following these indications [1]:

- The dental chair should be placed at a level in which the backs of the operator and his assistant are straight and vertical.
- The operator's arms should fall relaxed and parallel to the vertical axis of the microscope.
- Operator's forearms should be parallel to the ground.
- The headrest of the chair has to be changed in length and angle to position the patient's head to be on the proper occlusal plane.
- The orientation of the dentist and the patient's body orientation are similar to commonly used in dentistry.
- The operator usually will be between 9 and 12 hours.
- The distance between the operator and the patient is larger.

The initial steps in the majority of procedures are usually performed at low magnification, high magnification is to observe details. Usually, it is preferable to move the patient's head, the chair or see through the dental mirror, rather than having to be constantly adjusting the microscope [1].

To work in the maxilla is usually easier to get than in the mandible. The patient in the chair must be in supine position and the head tilted slightly back such that the chin is slightly raised. The vision of the buccal surfaces of the teeth and the maxillary alveolar processes will be carried out by direct vision without use of the mirror. However, to work on the palatal areas may be advisable to use indirect vision through the mirror [1,6].

Jaw procedures are usually more complex. The anterior teeth are easily viewed from the 12 o'clock position, although it is easier with the help of the mirror. The area which most problems represent is the occlusal surfaces of the mandibular posterior teeth due to soft tissue [1].

The use of the microscope in Oral Surgery is useful in procedures such as impacted teeth in which it is needed a mucogingival surgery to provide keratinized gingiva to the teeth erupted by vestibular and the application of the microscope in the surgical approach to the treatment of aggression and injury to the sensory nerves of the mouth area [1,6,10].

References