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The ophthalmologist and the grapes: A microsurgical training model

O oftalmologista e as uvas: Um modelo de treinamento microcirúrgico

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ABSTRACT

Objective: *Develop a training model for corneal surgery using grapes.* ***Methods:*** *Grapes were used as structures that mimic the size of the human eyeball, covered with latex materials, simulating the practice of corneal surgery using a videomagnification system. Eight simple stitches were performed. The surgical time was evaluated.* ***Results:*** *25 simulations were carried out as the model described. The mean time taken for the raffia was 34.56 ± 5.79 minutes. The analysis of the correlation between the time and the order of the surgeries showed a reduction in the confection time.* ***Conclusion:*** *The ophthalmic training model using grapes proved to be capable of simulating the basic stages of microsurgery suture training.*

Keywords: *Education, medical; Training; Low cost technology; Video recording; Animal use alternatives*

RESUMO

Objetivo: Desenvolver um modelo de treinamento de cirurgias corneanas utilizando uvas. **Métodos:** Foram empregadas uvas como estruturas que mimetizam o tamanho do globo ocular humano, recobertas com materiais de látex, simulando a pratica de cirurgias de córnea utilizando um sistema de videomagnificação. Foram realizados oito pontos simples. Foi avaliado o tempo de confecção do procedimento. **Resultados:** Foram realizadas 25 simulações como o modelo descrito. O tempo médio de realização da rafia foi de 34,56 ±5,79 minutos. A análise da correlação entre o tempo e a ordem das cirurgias mostrou uma redução no tempo de confecção. **Conclusão:** O modelo de treinamento oftalmológico utilizando uvas mostrou-se capaz de simular as etapas básicas do treinamento de suturas microcirúrgicas.

Descritores: Educação médica; Capacitação; Tecnologia de baixo custo; Gravação em vídeo; Alternativas ao uso de animais

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The current reserach was conducted at Pará State University Experimental Surgery Laboratory, Belém, Pará State, Brazil.

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Introduction

Ophthalmologists training is a long process,[1] mainly given the need of acquiring microsurgical skills, which require a long training process for trainees to be able to perform correct manipulation of instruments and use of the magnification system.[2,3]

Surgeon's lack of experience and skill during medical residency accounts a large number of operative complications that result in high costs and likely sequela for patients.[4-6] Therefore, there is the tendency to provide medical leaning in protected environment before practice in human beings [4,6,7] , since it is safer for patients and residents.

Using simulators in such a protected learning environment is highlighted because it changes the learning curve from the traditional learning model. Simulators allow training to the degree of competence and complexity of the resident, with step or difficulty repetitions, simulation of difficult or rare situations, greater opportunity for feedback, possibility of making mistakes without compromising results, among other benefits.[8-10]

Some models were developed to simulate several skills, with emphasis on the ones with pig's eye. Despite the similarities with the human eye, such a model is limited due to ethical concerns and costs associated with raising animals.[10] There are artificial simulators that can solve this problem, however, their high cost excludes many professionals from getting familiarized with the necessary techniques.[8,9] Therefore, the aim of the current study wasd to develop a low cost model for ophthalmological surgery training based on using grapes.

Methods

Cross sectional experimental study carried out at Pará State University Experimental Surgery Laboratory. The current study complied with the Brazilian research laws (Brazilian Law n. 11.794/08) and the Helsinki declaration. Pará State University Animal Ethics Committee assessed and approved the research project.

The training model was made of grapes (species Vitis vinifera L.) acquired in a local supermarket. A cross section cut was initially performed in one of the grape poles to remove approximately one fifth of its content. Next, the grapes were 'wrapped' on previously cut (and without dust) glove fingers. Glove finger excess was cut out. A blue party-balloon disk with the same diameter and area of the exposed part of the grape was used as model lid. After the model was complete (Figure 1), it was fixed with silicone pad from the box of microsurgical instruments.

Microsurgical training was performed using a video magnification system[11,12], which consisted of a Sony© Handycam HDR--XR160 camera connected to a 55 'Curve Full HD TV through HDMI cable. Two fluorescent light sources were used near the board to provide adequate lighting to the operating field. Two surgeons with more than 5 years experience in video microsurgery performed the surgical procedure.

Training consisted of eight simple knots, made with mono--nylon thread 10-0 and 80 µm needle (3 mm length and 3/8 circle). Initially, a knot was made at each cardinal point (0º, 90º, 180º and 270º) and then between cardinal points.

The assessed parameters were: 1) Grape size; 2) Model making time; 3) Costs; 4) Suture time. Microsoft® Word and Excel software were used for data assessment, graph plotting and photo editing.

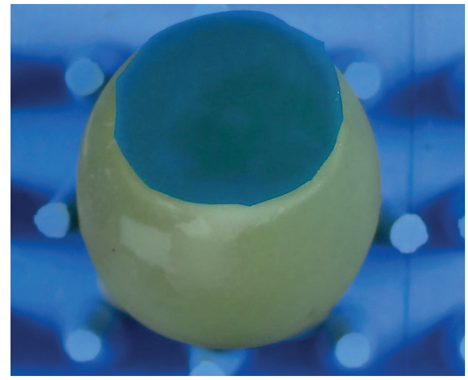

Figure 1: Training model completed

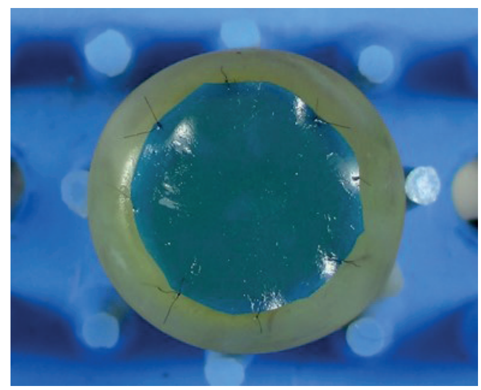

Figure 2: Training model with knots.

BioEstat© 5.4 software was used for statistical assessment. Pearson's correlation coefficient was assessed based on the time required for surgery and on surgery order, at 5% significant level.

Results

Used grapes mean size was 13mm (ranging from 11mm to 17mm). Mean model making time was 3 minutes (ranging from 2 to 7 minutes). Table 1 shows the total cost.

Twenty five simulations were performed with the described model (Figure 2). Mean suture time was 34.56 ±5.79 minutes. The corelation between surgy time and order showed reduction in the time required to perform the surgery (Pearson rho: -0.42, 95% CI: -027 – -0.90, p<0.01)

Table 1

Cost of model making and training

Item	Price	Quantity
Grapes	R$ 7.98	1 box
Party baloon	R$ 5.50	1 package
Box of gloves	R$ 40.00	1 box
Nylon 10-0	R$ 300.00	1 box
Total	R$ 353.48	Not applicable

Table 2
Global Classification Scale

Item	Score				
	1	2	3	4	5
1. Tissue care	Often used unnecessary force on tissue or caused damage to tissue		Carefully manipulated the tissue, but occasionally caused inadvertent damage		Consistently manipulated the tissue appropriately and caused minimal damage
2. Handling of instruments	Often made hesitant or clumsy movements with the instruments		Competent use of instruments, although occasionally made hesitant or clumsy movements		Appropriated and fluid movements with the instruments
3. Moviments	Many unnecessary movements		Efficient movements, but some unnecessary movements		Evident economy of movements and maximum efficiency
4. Ergonomy	Inadequate positioning that makes the procedure difficult		Inadequate positioning that can make it difficult to perform the procedure		Perfectly positioned in the operating field
5. Tremors	Macroscopic tremors		Tremors that do not impair the performance of the procedure		Absence of fine tremors
6. Suture technique	Clumsy and insecure, tying knots inappropriately and unable to maintain tension		Careful and slow, with most knots properly placed with adequate tension		Excellent suture control with proper knot placement and correct tension
7. Operation flow	Hesitation to perform the procedure and lack of confidence		Reasonable progression of steps, with some planning for procedure execution		The operation was carried out efficiently, with proper progression from one movement to another
Final Score					

Discussion

Microsurgical practice is one of the critical points in ophtomologists training.[7,10] The acquisition of microsurgical skills presents a long learning curve, since it encompasses the correct form of positioning and forming the monocular image, fine manual control and complex surgical techniques.[11,12]

Using simulation moves the learning curve and allows training ophthalmologist in order to reduce intra and postoperative complication levels, as well as ensures higher quality of care.[4,5,8-10] The current study described a low cost model easy to be made that allows training microsurgical skills by using grapes, since they have shape and size similar to those of the eye globe.

Using the video magnification enables microsurgical training to be conducted outside the laboratory. The training section can be recorded and possible mistakes can be discussed afterwards, with more experienced ophthalmologists.[11,12] In addition, the video system makes simulated training easier to access due to reduced cost with the acquisition of microsurgical microscopes.

Outcomes in the current study confirm the viability of the model, but additional parameters can be used to better quantify microsurgical training such as quality of the knots, distance between stitches, time of each suture, number of unnecessary movements and perforations, number of lesions in grape pulp, among others. Therefore, it is possible developing specific training protocols focused on residents' skill level.[10] A Global Classification Scale was developed based on this premise (Table 2),[13] it can be used as objective criterion for assessing and certifying the training process.

The main limits of the herein presented model are: low fidelity regarding the extra orbital and orbital structures (aqueous humor, cornea, among others), difficulty in fixing the model, lack of three-dimensional vision due to the use of the video system. However, these limitations do not render the model usless; it can be widely used in initial training stages.

Conclusion

The ophthalmic training model based on using grapes proved to be capable of simulating the basic suture training stages. The model has low cost and is easy to be made and purchase, as wells can be easily adapted for ophthalmology residents' training.

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