Learning on animal models: a 16-year experience with the theoretical-practical course on surgery of polytrauma

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The aim of this paper was to highlight, the important features of this course:
– an update on the pathophysiology of the trauma patient, on the common maneuvers of damage control surgery and their indications, on surgical techniques and their rationale in the various regions of the body, and indications and modalities of non-operative treatment (NOM);
– participants test their knowledge and skills through an interactive approach, considering the resources of the hospitals of origin;
– an extremely realistic approach to trauma surgery and likewise a possibility to observe and test, "in the field", products such as topical hemostatic agents, which are frequently used in this kind of surgery.

KEY WORDS: Animal models, Training simulation

The Theoretical-practical Course on Surgery of Polytrauma was created in Bologna in 2002 by the physicians of the Emergency and Trauma Surgery units of Maggiore Hospital (Bologna), directed by Dr. Franco Baldoni, and Gemelli Polyclinic (Rome) [1-3]. It was not a completely original idea but, as in the case of other courses proposed at that time [4,5], the stimulus was the evidence of a reduction in surgical expertise due to a decreasing exposure to trauma surgery mainly caused by the increase in the number of lesions treated non-operatively or through alternative methods, and a consequent lowering of surgeons' interest in this subspecialty [6].
Moreover, serious deficiencies in this sector in Italy were identified. On the one hand, there were problems regarding assistance to the trauma patient, as the remarkable diversity of welfare models among regions and hospitals in terms of organization and resources showed. On the other hand, there was a complete absence of training proposals from both universities and scientific societies.

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This led to the formation of a group of experts selected on the basis of the experience gained during their clinical activity. It was decided that that each participant should have already had basic training in the field. For this reason, an Advanced Trauma Life Support (ATLS) or qualification as an ATLS instructors was a prerequisite
First of all, the experts focused on the following:
– definition of educational objectives;
– skills achieved through the course: a) *cognitive skills,* through interactive discussion; b) *psychomotor skills*, through surgical practice, the opportunity to improve relational skills under stress conditions and discussion with other specialists about methodology and the clinical review;
– awareness of peculiar aspects of adult education, which enhances participants' desire to update their knowledge/skills and to use the experience gained within the course Therefore, the Theoretical-Practical Course on Surgery of Polytrauma was from the beginning characterized by two main features: the overall assistance of the trauma patient and the adherence to the Italian guidelines, especially in the presentation and discussion of clinical cases. Thus, the course is intended for those who are involved in trauma care, despite not working in a high-volume trauma center.

The course lasts for two days, one of which is dedicated to the theoretical part with presentations in a classroom setting on different aspects of the assistance in trauma, from the pathophysiology of the trauma patient to diagnostic methods, the principles of damage control , and the surgical techniques for treating parenchymal and visceral lesions of the chest and abdomen. Classroom lectures are linked to each other through the presentation of clinical cases and time is allowed for questions from the participants. The practical part takes place on the second day, and lasts the whole morning. In the afternoon, specific topics such as non-surgical treatment, penetrating lesions and antibiotic stewardship are explored. At the end of the course, participants are asked to fill out an evaluation and satisfaction questionnaire.
The practical part, which involves large pigs, intubated and controlled by intensive care anesthesiologists in complete accordance with the current national legislation on animal testing, shows the validity of teaching on animal models:

"*Simulation is being recognized as one way to offer residents and others real life-like learning experiences to promote acquisition or retention of skills*" [7].

During the surgical activity,participants, in groups of 3 with 1 instructor and 1 pig per group, have the opportunity to apply all the maneuvers of pelvic, abdominal and thoracic damage control surgery, with the assistance of modern tools, such as topical hemostats and mechanical staplers. In addition, they are given the possibility to perform maneuvers uncommon in normal surgical practice, such as thoracic access to the superior vena cava or suture of heart injuries. Also, participants are shown how to use new generation devices, such as the endoaortic balloon.
In order to make the location as realistic as possible, particular attention is always paid to setting up the operating room and the operating table with constant participation of nurses.
The use of live animals has the advantage of directly demonstrating the effectiveness of the maneuvers, which are then implemented by the participants. In particular, control of hemostasis after creation of parenchymal or vascular lesions is commonly performed. Injuries of the various vascular districts are contextualized through the presentation of a clinical case in order to convey a methodology for surgical exploration and identification of priorities.
The possibility to achieve such a high degree of "realism" is the main advantage of teaching with animal models - and it is unlikely to be obtained using reperfused anatomical preparations.
Over the years, 21 surgeons felt the need to participate again 10-12 years after the time they had first attended the course. This again shows the validity of both the course and the educational assumption which identified learning and maintenance of skills over time as one of the most compelling needs in training.
In the past 3 years the course was held in Bologna, Rome and Bergamo. In 2006 it obtained the patronage of the S.I.C.U.T. and in 2012 it became part of the A.C.O.I. Special School program. More than 500 students from all over Italy and Italian-speaking Switzerland participated in the course. All groups of surgical professionals were represented, from Residents to Chiefs of Surgical Divisions. Since 2016, participation of auditors (Emergency Medicine physicians and Anesthesiologists) has been allowed in the theoretical part only. With regard to the change in the type of participants, it was noted,during the Regional S.I.C.U.T. Congress in Potenza (2009), that after seven years of the course and probably due to the high fee,almost no residents participated. Nevertheless, today residents represent a significant presence among the participants, so that in 2019 a special dedicated edition will be organized with more targeted learning objectives and a lower participation fee.

Conclusion

Trauma Surgery Course based on animal models may be the most appropriate training proposal in this field. Future challenges will be constant updating ,the identification of emerging topics of particular interest, the possibility to organize refresher sessions with lower fees and the ability to adapt teaching to new kinds of learners. Last but not least, efforts should be made to overcome the high management costs of an animal-based course in a branch of surgery which is not very attractive for external sponsorships.

Riassunto

Il lavoro vuole sottolineare, mediante l'esperienza maturata, la validità e la peculiarità di questo Corso e di questo modello che permette:
– un update su quella che è la fisiopatologia del paziente traumatizzato, sulle comuni manovre di Damage Control Surgery e le loro indicazioni; sulle tecniche chirurgiche ed il loro razionale nei vari distretti e le indicazioni e modalità del trattamento non operatorio;
– la possibilità per i discenti, mediante la discussione interattiva, di confrontarsi sulle scelte diagnostico-terapeutiche anche considerando le risorse degli ospedali di provenienza;
– un approccio estremamente realistico alla chirurgia del trauma ed un altrettanta realistica possibilità di osservare e testare "sul campo" prodotti, quali emostatici topici, di peculiare impiego in questa chirurgia.
Si sottolinea, inoltre, il numero e la tipologia di partecipanti nei 16 anni trascorsi

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