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Can mathematic formulas help us with our patients?

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Dear Editors,

We read with special interest the article entitled "Incisions do not simply sum" by Thane Blinman [1]. In his paper, the author states, based on an interesting and elegant mathematical model, that conventional incisions are subject to more tension than laparoscopic incisions, even when the total length is equal.

We have been working with needlescopic surgery for more than 10 years [2], and we have always advocated that the difference between incision sizes is important, based on another much simpler mathematical model: the use of a cylindrical geometrical model to calculate the injury volume of different sizes of laparoscopic incisions. The cylinder volume is calculated by the well-known formula, volume $= \pi r^2 h$, so it is easy to comprehend that the injury volume is directly and exponentially proportional to the radius of the incision (Fig. 1).

Figure 2 illustrates the results for a hypothetical abdominal wall lesion with different surgical approaches, showing the potential damage to the abdominal wall increasing exponentially as the diameter of the cylinder increases.

The advent of minimally invasive surgery, and its widely recognized strides forward in the last years, presented to laparoscopic surgeons other feasible surgical options. In the world surgical community, we have seen great comparisons among these new techniques. First, some years ago, we saw laparoscopic surgery versus laparotomy mini-incisions, where laparoscopy proved to be better in most regards. Now, the "new kid on the block" is laparoendoscopic single-site surgery (LESS), which is probably one of the most popular of these new technologies that have been rapidly incorporated into surgical practice.

On the one hand, after initial contact with this approach and proof that most regular laparoscopic surgeries can be accomplished by this method [3, 4], an important question still remains unanswered: is single-access surgery better than the laparoscopy we have been performing for more than 20 years? LESS procedures have strong cosmetic appeal, especially when the umbilicus is used as the entry port, but is this followed by an equal reduction in inflammatory response and by postoperative benefits to patients (reduction of pain, and less short- and long-term complications)? We certainly do not yet know the answer [5].

On the other hand, needlescopic surgery, a refinement of usual laparoscopic approach, has already been among us for more than 15 years, and with its diminutive needle scars, is supposed to offer almost the same esthetic outcomes as natural orifice transluminal endoscopic surgery (NOTES), with an even better umbilical scar compared with LESS, keeping umbilical injury to the same standards as 10-mm laparoscopy.

Table 1 shows cylinder volumes for a fixed typical abdominal wall height of approximately 31.85 mm. It is interesting to observe that our mathematical conclusions are the same as expressed by Blinman in his recent paper [1], and LESS will probably offer worst results than conventional laparoscopy.

Nowadays we still need randomized controlled trials (if economically feasible), and this kind of mathematical models may be our best available alternative for making

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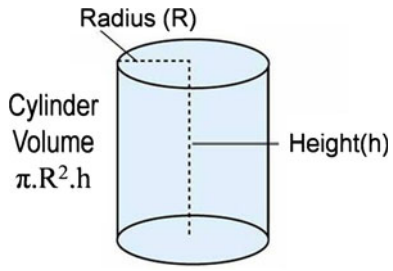

Fig. 1 Cylinder volume

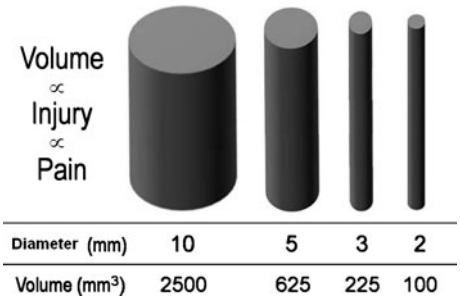

Fig. 2 Relationship between cylinder volume, grade of injury, and pain

Table 1 Parietal injury versus somatic pain ($h = 31.85$ mm)

Technique	Incisions	Volume ($\pi r^2 h$)
NOTES	Pure—no skin incision	~0
Hybrid NOTES	2 mm × 2	200
Hybrid NOTES	5 mm × 1	625
LESS (single port)	20 mm	10,000
LESS (single port)	28 mm	19,600
Minilaparoscopy	10 mm + 3 mm + 2 mm × 2	2,925
Laparoscopy	10 mm × 2 + 5 mm × 2	6,250

decisions about which kind of procedure should be offered to patients [6].

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References

1. Blinman T (2010) Incisions do not simply sum. Surg Endosc [Epub ahead]. doi:10.1007/s00464-009-0854-z
2. Carvalho GL, Silva FW, Silva JS, de Albuquerque PP, Coelho Rde M, Vilaça TG, Lacerda CM (2009) Needlescopic clipless cholecystectomy as an efficient, safe, and cost-effective alternative with diminutive scars: the first 1000 cases. Surg Laparosc Endosc Percutan Tech 19(5):368–372
3. Savaris R, Cavazzola LT (2009) Ectopic pregnancy; laparoendoscopic single site surgery – laparoscopic surgery through a single cutaneous incision. Fertil Steril 92(3):1170.e5–1170.e7
4. Müller EM, Cavazzola LT, Machado Grossi JV, Mariano MB, Morales C, Brun M (2010) Training for laparoendocopic single-site surgery (LESS). Int J Surg 8(1):64–68
5. de Campos Martins MV, Skinovsky J, Coelho DE, Ramos A, Galvão Neto MP, Rodrigues J, de Carli L, Totti Cavazolla L, Campos J, Thuller F, Brunetti A (2009) Cholecystectomy by single trocar access (SITRACC): the first multicenter study. Surg Innov 16(4):313–316
6. Cavazzola LT (2008) Laparoendoscopic single site surgery (LESS) - Is it a bridge to natural orifice translumenal endoscopic surgery (NOTES) or the final evolution of minimally invasive surgery? Editorial. Braz J Videondosc Surg 1(3):93–94