Radially Dilating Trocars: A Possible Alternative to Standard Trocars

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Introduction:

- Laparoscopic techniques reduce postoperative pain, decrease length of stay, and have quicker postoperative recovery
- A major post-operative complication of laparoscopic surgery is port-site hernias, which are related to the fascial defect size
- Conventional trocar systems use bladeless trocars to enter through the layers of the abdominal wall
- Radially dilating trocars split muscle fascia along its fibers and stretches them rather cutting them, allowing for recoil of the fascia and muscle after port removal
- One noted drawback to radially dilating trocars has been decreased retention force *in-situ*
- The Xpan™ Universal Trocar System is a radially dilating device compatible with 3 mm, 5 mm, and 12 mm obturators
- Our objective was to compare fascial defect size & retention forces between the Xpan™ device and standard bladeless trocars



Figure 1. Xpan™ Universal Trocar System

Methods:

Fascial Defect Measurements

- Trocars were placed bilaterally in the abdominal walls of 6 Yorkshire pigs post-mortem
- Bladeless trocars placed on one side and radially dilatating placed on contralateral side
- Bladeless trocars inserted into 3 port sites: 5mm, 12mm, and a 5mm upsized to a 12mm
- Xpan™ trocars inserted into 3 port sites: 3mm trocar dilated to a 5mm, 12 mm, and then 5mm to a 12 mm
- Devices inserted for five minutes, abdominal wall excised, fascial layers of abdominal wall exposed
- Taper gauge was inserted into the trocar pathway to measure the area of inner fascial defect
- Mann-Whitney U test was used for statistical analysis

Retention Force Measurements

- Trocars were inserted into the abdominal wall of 10 Yorkshire pigs post-mortem
- A strain gauge was used to measure force required for removal
- Mann-Whitney U test was used for statistical analysis

Results

Table 1. Inner Fascial Defect Size Median [IQR]

	Xpan™ RDT (n=6)	Bladeless Trocars (n=6)	*p*-value
5mm (mm^2)	6.3 [6.23-7.05]	6.3 [6.3-7.05]	0.87
12mm (mm^2)	10.35 [9.65-10.9]	12.5 [11.9-12.58]	0.0083
5mm upsized to 12mm (mm^2)	11.2 [10.33-11.4]	13.3 [13.05-13.4]	0.0051

Disclosures: Z.A. is CEO of Xpan™
LN is a clinical advisor for Xpan™

Table 2. Retention Forces Median [IQR]

	Xpan™ RDT (n=10)	Bladeless Trocars (n=10)	*p*-value
5mm (mm)	50.54 [37.86-57.06]	18.18 [15.34-22.38]	0.00018
12mm (mm)	48.40 [46.66-54.68]	29.03 [25.56-31.51]	0.00058

Conclusions:

- The 12mm and 5mm to 12 mm upsized radially dilating trocars generate a significantly smaller fascial defect compared to the respective conventional bladeless trocars
- Retention force for 5mm and 12 mm Xpan™ trocars was significantly higher compared to bladeless trocars
- The decreased inner fascial defect size and increased retention force demonstrates Xpan™ Universal Trocar System is a viable alternative to bladeless trocars
- This data suggests that radially dilating trocars minimize abdominal wall disruption which may lead to decreased incidence of port site complications such as hernias



Figure 2. Taper gauge measuring inner area of fascial defect