

**Fracture at the input tube - cylinder junction of AMS 700 inflatable penile prostheses as a complication of a modified implantation technique in a series of 99 patients**

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## ABSTRACT

**Objectives.** To compare the incidence of a specific failure mode of the penile implant, fracture at the input tube - cylinder junction, with respect to two methods of managing the input tube.

**Methods.** AMS 700 series three-piece inflatable penile prostheses were implanted in the first 26 patients using an ordinary technique in which the input tubing runs alongside the cylinder within the corpus and exits through the corporotomy ('Method A'). In the subsequent 73 men, the input tube exited through a separate stab wound in the proximal corpus using a modification of the basic surgical technique ('Method C'). The mean follow-up period was 136.4 months for 'Method A' and 69.0 months for 'Method C'. The incidence of fracture at the junction of the input tube and cylinder was compared according to the variables of input tube management, prostheses types, and width of the proximal corpora.

**Results.** The overall incidence of mechanical failure was 12.1%. Fractures at the input tube - cylinder junction with leaking occurred in 7 patients. The cylinders in these patients were all implanted using 'Method C'. The incidence of fracture at the junction was significantly higher ( $p < 0.05$ ) in men with narrow corpora (17.1%) than in the others (0%), regardless of the type of prostheses implanted. The average functional duration of the failed prostheses was 66.1 months.

**Conclusions.** The modified surgical procedure ('Method C') should be avoided in patients with a narrow width penis due to an increased likelihood of damage to the input tube - cylinder junction.

Key Words: Inflatable penile prosthesis, Input tube, Fracture

## INTRODUCTION

Conventional methods used for implantation of the cylinders of three-piece inflatable penile prostheses have relied on ‘Method A’ (Fig. 1A) or ‘Method B’ (Fig. 1B)<sup>1,2</sup>, according to how the input tubing is managed. In 1989, Scarzella<sup>3</sup> suggested a new technique (‘Method C’) for implanting the AMS 700CX inflatable penile prosthesis. This method brings the input tube out through a separate stab wound in the proximal corpus (Fig. 1C), and thereby combines the advantages of ‘Method A’ and ‘Method B’; fewer RTEs with a longer cylinder and avoidance of input tube contact with the side of the cylinder. To date, there have been no published reports of clinical experiences with this modified surgical method.

We implanted AMS 700 series, three-piece inflatable penile prostheses in 99 patients with erectile dysfunction over a 13-year period and experienced an unusual complication related to ‘Method C’.

## MATERIALS AND METHODS

The patient population was comprised of 99 men who had undergone implantation of AMS 700 series, three-piece inflatable prostheses between 1985 and 1998. They ranged in age from 19 to 71 years with an average of  $43.7 \pm 12.7$  years. AMS 700 CXM prostheses were implanted into 45 patients, AMS 700 Ultrex prostheses into 27 patients, AMS 700 CX prostheses into 18 patients, and AMS 700 PPT prostheses into 9 patients (Table 1).

Through a transverse penoscrotal skin incision, the corpus cavernosum was exposed and dilated with Hegar dilators. Measurements of the corpora were taken and then the proper size cylinders were selected on the basis of the total corporeal length. We did not implant a three-piece hydraulic penile prosthesis when marked resistance to dilation of the corpora with a 14-mm Hegar dilator was noted. Only for the men who were dilated with a 15 mm Hegar dilator, were three-piece hydraulic penile prostheses implanted using 'Method A' between April 1985 and August 1990, and using 'Method C' thereafter.

In 'Method A' the input tube runs alongside the cylinder within the corpus and exits through the corporotomy (Fig. 1A). In 'Method C' the input tube exits directly through a separate stab wound in the proximal corpus (Fig. 1C). To determine where to place the stab wound, the distance from the crural end of the cylinder to the input tube (2 cm in CX or 3 cm in Ultrex) was subtracted from the length between the corporotomy and the crural end of the corpus cavernosum (proximal measurement of the corpora). The result was the distance of the stab wound from the corporotomy. When RTEs were used, their total length was added to the 2 or 3 cm distance to subtract from the proximal measurement of the corpora.

After creating the stab wound a right angle clamp, which obliquely grasped the end of the input tubing, was inserted into the proximal corpus through the corporotomy and directed to the stab wound, then the clamp tip grasping the input tube was protruded out through the stab wound. The end of the input tube was, then, grasped by another right

angle clamp outside of the corpus to pull out the tube. Next, the cylinder was placed into the proximal corpus. In this part of the procedure, the cylinder with its attached input tube must be placed inside the proximal corpus down to the area of the stab wound. At this point, some difficulty placing the cylinder into the proximal corpus of small width penes was encountered. In such cases, the cylinder was pushed into the proximal corpus and the input tube previously drawn out through the stab wound was simultaneously pulled out forcefully to help the cylinder slide down proximally and be implanted easily.

We were informed of the functional status of the implant by chart review, direct telephone interview or mailed questionnaire. ‘Method A’ was used in 26 patients (26.3%) with a mean follow-up of  $136.4 \pm 19.1$  months (range: 108 - 168 months). ‘Method C’ was used in the remaining 73 patients (73.7%) with an average follow-up of  $69.0 \pm 27.5$  months (range: 15 - 163 months) (Table 1). Among 73 men who were implanted by ‘Method C’, 41 (56.2%) had narrow corpora which means implantation of the cylinder into the proximal corpora was not easy due to a narrow inner diameter of the proximal corpus. In these cases, the input tube was forcefully pulled out during cylinder implantation as described above.

The Fisher’s exact test was used for comparison of the incidence of fracture at the input tube-cylinder junction according to the surgical methods, types of the prostheses implanted, and width of the proximal corpora. Results were considered statistically significant when  $p < 0.05$ .

## RESULTS

The incidence of mechanical failure was 12.1% (12/99). In 7 patients, fractures were found at the junction of the input tube and cylinder (4 cases with Ultrex and 3 cases with CXM) (Table 1 & Fig 2). The cylinders of the 7 patients with fractures were all implanted using 'Method C'. The mean functional duration of the prostheses with fractures was 66.1 months (range: 26 - 83 months) (Table 2). The remaining 5 mechanical failures were: a fracture of the input tubing near the connector between the cylinder and pump (CX, 'Method A'), two cases of rupture of the cylinders in their mid-shaft (Ultrex and CXM, 'Method C'), a pump malfunction (Ultrex, 'Method C'), and a fracture of the tubing quite near the pump (Ultrex, 'Method C') (Table 1).

The incidence of fracture at the input tube-cylinder junction after implantation with 'Method C' was significantly ( $p < 0.05$ ) higher in men with narrow corpora (17.1%, 7/41) compared with that (0%, 0/32) in others. No difference ( $p > 0.05$ ) in fracture rate at this junction according to the type of prostheses implanted was found (Table 1).

## COMMENT

The two conventional methods ('Method A' and 'Method B') used for implantation of the three-piece, inflatable penile prosthesis vary in the compromise made between a potentially higher risk of implant failure and a more cosmetic result. 'Method A' selects the closest cylinder length that is shorter than or equal to the total corporeal length. RTEs are used only if the total corporeal measurement lies between cylinder sizes. Thus, fewer RTEs are needed and longer cylinders can be implanted, giving a better cosmetic result because the distensible portion of the cylinder is as long as possible. The drawback to 'Method A' is that the input tube runs alongside the cylinder within the corpus and is brought out through the corporotomy, which increases the risk of cylinder wear by contact with the input tubing.<sup>1,4</sup> In contrast, 'Method B' subtracts 2 cm from the total corporeal length to calculate an adjusted measurement, and then selects the nearest cylinder length which is shorter than or equal to this measurement and adds RTEs to fit the total corporeal length, thereby moving the site of the input tube – cylinder junction to the corporotomy. In this method, the input tubing sleeve exits directly from the corporotomy, which mitigates the risk of cylinder wear of 'Method A' by avoiding contact of the input tube with one side of the cylinder (Fig 1B). This second method makes implantation of the cylinder into a narrow width penis easier, however, it makes the length of the solid portion of the cylinder longer, giving a less cosmetic result and making the solid portion palpable at the penile base.<sup>1,2</sup>

In 1989, Scarzella<sup>3</sup> developed a new technique ('Method C'), which combines the advantages of 'Method A' and 'Method B'; namely a cylinder as long as possible and the input tubing does not course alongside the cylinder within the corpus. In this method, selection of the cylinder length is the same as 'Method A', but the input tubes are brought out through a separate stab wound in the proximal corpus. We experienced an unusual mechanical failure related to 'Method C'. Fractures at the junction of the input tubes and cylinders occurred in 7 of 73 patients (9.6%). The cylinders of the 7 patients with fractures were all implanted using 'Method C'. The incidence of fractures at this junction was significantly higher in men with narrow corpora than in the others, regardless of the

type of prostheses implanted. There were no such fractures among the patients of 'Method A', although the follow-up period was longer. A possible explanation of the fractures experienced with 'Method C' is that cracks or incomplete fracture might develop at the input tube - cylinder junction when the input tube is forcefully pulled out through the stab wound to help the cylinder slide down proximally and be implanted easily. This pulling procedure could exaggerate the excessive angle of protrusion of the input tube from the cavernous cylinder, which may injure the input tube-cylinder junction. These cracks or incomplete fractures, which were also found incidentally during exploration in patients with mechanical failures in the other parts of the implanted prostheses (Fig. 3), may progress to complete fractures with leaking if the excessive angle between the tube and cylinder is exaggerated as might occur during intercourse.



## CONCLUSIONS

Our experiences suggest that ‘Method C’ may damage the input tube at its junction with the cylinder during implantation into a narrow-width penis, ultimately leading to fracture of the input tube at this location and prosthesis failure. Therefore, ‘Method C’ is not recommended for use in a narrow-width penis although it certainly has merit in other cases.

## REFERENCES

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**TABLE 1. The number of mechanical failures according to operation methods and types of prostheses implanted**

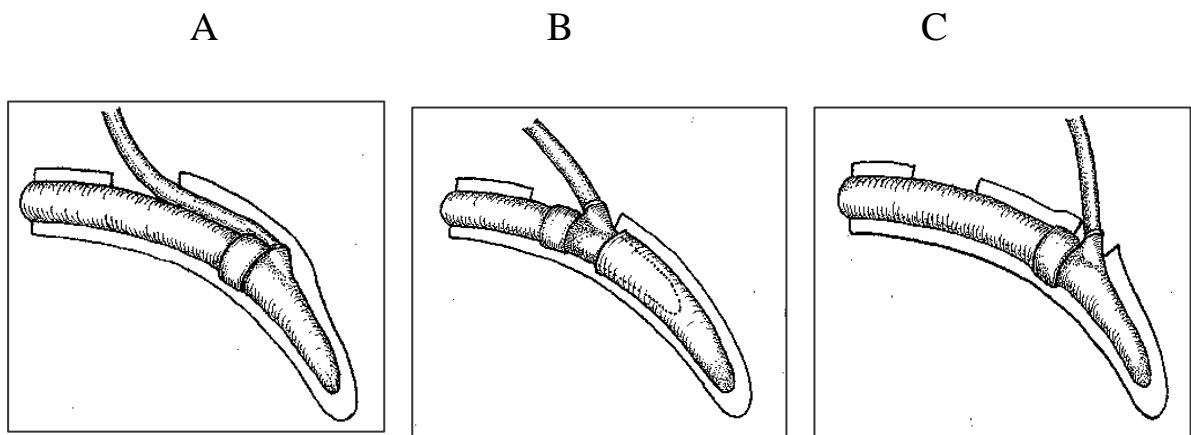
Methods	Operation		Prosthesis		Mechanical failure	
	No. (%)	F/U (months) <sup>@</sup>	Types	No. (%)	Fracture at junction	Others <sup>#</sup>
Method A	26 (26.3)	136.4 (108-168)	700 PPT	9 (9.1)	0	
			700 CX	17 (17.2)	0	1
Method C	73 (73.7)	69.0 ( 15-163)	700 CX	1 ( 1.0)	0	
			700 Ultrex	27 (27.3)	4 (14.8)*	3
			700 CXM	45 (45.5)	3 ( 6.7)	1

\*: Not significantly different from CXM data ( $p=0.41$ ), @: Mean and range of follow-up period.

#: Others include a fracture of the input tube near the connector (CX), two ruptures of the cylinders in their mid-shaft (Ultrex and CXM), a pump malfunction (Ultrex), and a fracture of the tube near the pump (Ultrex).

**TABLE 2. Functional duration of the prostheses with fractures  
at the input tube-cylinder junction**

Case	Duration (month)
1	26
2	79
3	53
4	68
5	82
6	72
7	83
Mean	$66.1 \pm 20.5$



**FIGURE 1. Methods used for implantation of the cylinders.** **A:** Method A; input tube runs alongside the cylinder within the corpus and comes out through the corporotomy. **B:** Method B; input tube exits directly from the corporotomy by adding rear tip extenders. **C:** Method C; input tubes are brought out through a separate stab wound in the proximal corpus.

**FIGURE 2. Gross fracture with leak (white arrow) at the input tube-cylinder junction.**

**FIGURE 3. Incidentally found incomplete fracture without leak at the input tube - cylinder junction during exploration of the malfunctioning prosthesis.**