

Functional medicine

## Excessive fibrosis and non-function after ATOMS (adjustable transobturator male system): A case of capsular contracture?

Marco Pedrini<sup>1</sup>, Jannik Stuehmeier<sup>\*</sup>, Lukas Andrius Jelisejevas, Alexandra Gulacsi, Wolfgang Horninger, Peter Rehder<sup>1</sup>

Medical University Innsbruck, Department of Urology, 35 Anich Street, 6020, Innsbruck, Austria



## ARTICLE INFO

## Keywords:

ATOMS  
Capsular contracture  
Radical prostatectomy and urinary incontinence  
Fibrosis and complications

## ABSTRACT

The adjustable transobturator male system (ATOMS) treats post-prostatectomy urinary incontinence by compression of the proximal bulbous urethra. It reminds of the Kaufman prosthesis described in 1978. We describe a case where an excessive fibrotic reaction occurred around the cushion. Furthermore, the bulbous urethra underneath, developed severe atrophy devoid of any visible blood supply. We suspect ongoing shear forces around the cushion while sitting resulting in a chain reaction of acute through chronic inflammation and progressive fibrosis and encapsulation. Does the encapsulation lead to capsular contracture resulting in non-function?

## Introduction

Urinary incontinence because of a radical prostatectomy may be devastating in terms of quality of life. Men suffering from urinary incontinence have difficulties returning to normal life. A failed incontinence operation may be even more disastrous to these men, as this means dealing with a complication of a surgical procedure done to correct another surgical complication. We describe a case of an incontinent patient after radical prostatectomy followed by external beam irradiation. He received an adjustable transobturator male system (ATOMS).<sup>1</sup> Several filling adjustments followed.<sup>2</sup> Seven years after the initial ATOMS, a newer generation model replaced it. Ongoing perineal pain and incontinence was the result. The patient then wanted ATOMS removal, and implantation of an artificial urinary sphincter (AUS). At the ATOMS explantation, excessive fibrosis and urethral atrophy limited further options. A 3 cm fibrous capsule surrounded the cushion, very similar to capsular contracture as described for silicone breast implants.<sup>3</sup>

## Case presentation

An 87-year-old patient received his first incontinence procedure (ATOMS) at 79 years of age at a regional hospital in 2011. The device needed multiple adjustments to the filling volume, but unfortunately, the patient remained incontinent. This led to removal of the ATOMS,

with implantation of a new generation ATOMS prosthesis in 2018. The patient still suffered from total incontinence and had severe perineal pain. The patient then consulted us at a tertiary centre, with the wish of ATOMS explantation and AUS implantation. Clinical examination showed prominent painful perineal bulging without any signs of acute infection or inflammation. Videourodynamics showed total urinary incontinence and a patent urethra without strictures, with no compression of the urethra at all. A staged procedure followed starting with the explantation of the device. At operation, a 3 cm thick fibrous capsule surrounded the cushion, with elements of capsular contracture. Emptying the port resulted in 23 ml contrast solution in the syringe (Fig. 1). The overfilled cushion allowed some mobility being fixated with the sling arms around the inferior pubic rami. Excision of the cushion and the sling pieces around the inferior pubic rami followed. After excision of all redundant scar tissue, histological examination revealed extensive fibrosis, an abundance of fibrocytes, siderophages indicating old haematoma, and granulation tissue including fibroblasts (Figs. 2 and 3). The corpus spongiosum appeared pale and non-compliant. Without at least a rim of vascularized spongy tissue around the urethral wall, even an AUS would not suffice to rectify the situation. The patient wanted a definitive solution being continent as a result. Consequently, after discussing it with the patient, he opted for bladder outlet closure with placement of a definitive suprapubic catheter.

\* Corresponding author.

E-mail address: [Jannik.Stuehmeier@i-med.ac.at](mailto:Jannik.Stuehmeier@i-med.ac.at) (J. Stuehmeier).

<sup>1</sup> Marco Pedrini and Peter Rehder are equally contributing first authors.

<https://doi.org/10.1016/j.eucr.2020.101241>

Received 23 April 2020; Accepted 3 May 2020

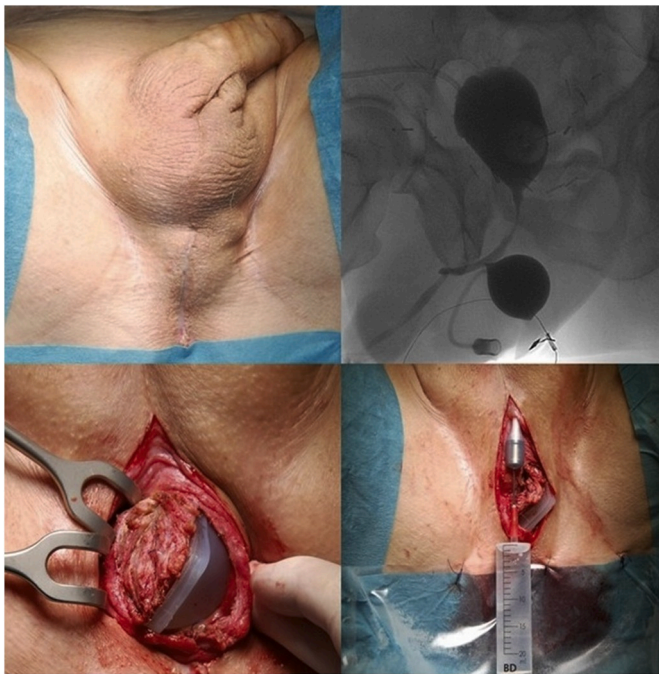
Available online 6 May 2020

2214-4420/© 2020 The Authors.

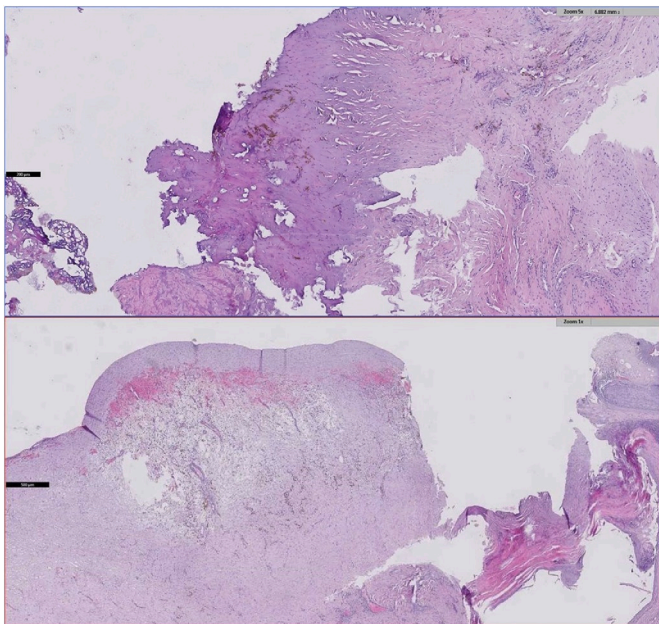
Published by Elsevier Inc.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



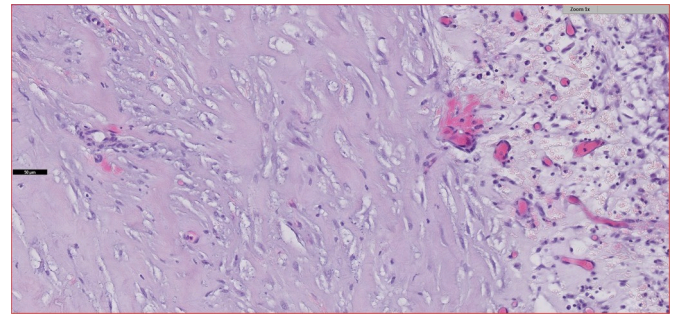
**Fig. 1.** From top left then clockwise: Perineal bulge caused by ATOMS; No compression on urethra by ATOMS cushion; Overfilling of cushion with 23 ml contrast solution; 3 cm fibrotic capsule around cushion.



**Fig. 2.** Top: Histology H&E 10x magnification (zoom 5x) of fibromuscular tissue with inflammatory granulation tissue with old bleeding and siderophages at sling connection site to cushion excised at inferior pubic ramus. Bottom: Histology H&E 10x magnification (zoom 1x) of membrane-like fibromuscular tissue at site around cushion with fresh and old bleeding sites.

## Discussion

Compressive devices to obstruct the urethra may be problematic. It remains difficult to gauge the amount of pressure needed to compress the urethra to treat urinary incontinence, at the same time allowing for unobstructed flow of urine. Too much compression may lead to compromised blood supply of the urethral and bulbous tissues. The



**Fig. 3.** Histology H&E 50x magnification (zoom 1x) showing fibrohyalinated tissues with fibrocytes and fibroblasts including siderophages (haemosiderin laden macrophages) in thick pseudocapsule around ATOMS cushion.

problem in this case was an overfilled ATOMS cushion encased in a 3 cm fibrotic capsule showing signs of capsular contracture. This resulted in a progressive round configuration of the cushion with no pressure effect on the urethra. The cellular mechanisms of contracture includes differentiation of fibroblasts to form myofibroblasts with expression of alpha-actin filament bundles.<sup>4</sup> The stages of fibrosis are as follows: blood-biomaterial interaction, provisional matrix formation, acute and chronic inflammation, foreign body giant cell appearance and fibrous capsule formation.<sup>3</sup> Furthermore, cushion movement during sitting caused tension on the mesh slings at the inferior pubic rami. This may explain the progressive pain the patient experienced, which resolved after complete ATOMS removal. The shear forces between the fibrotic capsule and the cushion may have triggered an ongoing process of fibrosis. This process was limited to fibrosis around the ATOMS system. The bulbous urethra was completely atrophic and non-compliant. In this setting, an AUS gives unsatisfactory results. The possibilities of a transcorporeal cuff with the gullwing modification is possible, but the tissues were all too atrophic.<sup>5</sup> External beam irradiation may lead to spongiofibrosis with development of a subsequent urethral stricture. Modern protocols of irradiation seldom affect the perineal subcutaneous tissues. Irradiation is a relative contra-indication to the implantation of an ATOMS.<sup>2</sup> In these cases, an AUS should be preferred. Overfilling of the ATOMS cushion with contrast solution does not improve the clinical outcome.

## Conclusion

The adjustable transobturator male system (ATOMS) may lead to excessive fibrotic encapsulation losing its ability to compress the urethra. This may be a form of capsular contracture similar as occurs in silicone breast implants. The movement of the cushion during sitting, with resultant shear forces, may trigger an ongoing fibrotic process in select cases.

## Consent

Patient data anonymized and consent obtained for publication of data.

## Declaration of competing interest

MP, LAJ, AG, WH: no conflicts of interest.

JS: Speaker for Boston Scientific.

PR: Speaker for Boston Scientific, Co-inventor of the AdVance Male Sling.

## Acknowledgements

Dr. Murat Okcu and Dr. Afschin Soleiman at the Department of Pathology, Tirol-Kliniken Innsbruck, for investigating the histological

specimens and supplying the images.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## References

1. Friedl A, Muhlstadt S, Zachoval R, et al. Long-term outcome of the adjustable transobturator male system (ATOMS): results of a European multicentre study. *BJU Int.* 2017;119(5):785–792.
2. Muhlstadt S, Angulo JC, Mohammed N, Schumann A, Fornara P. Complications of the urinary incontinence system ATOMS: description of risk factors and how to prevent these pitfalls. *World J Urol.* 2019 Sep 21. <https://doi.org/10.1007/s00345-019-02962-w> [Epub ahead of print].
3. Shin BH, Kim BH, Kim S, Lee K, Choy YB, Heo CY. Silicone breast implant modification review: overcoming capsular contracture. *Biomater Res.* 2018;22:37.
4. Simsek A, Aldamanhori R, Chapple CR, MacNeil S. Overcoming scarring in the urethra: challenges for tissue engineering. *Asian J Urol.* 2018;5(2):69–77.
5. Chouhan JD, Terlecki RP. A user's guide for surgery involving the artificial urinary sphincter. *Sex Med Rev.* 2019;7(1):167–177.