Pseudoaneurysm after Radical Prostatectomy

Subjects: Surgery
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Prostate cancer (PCa) is the most common malignant tumor among men in the Western world. Men with a life expectancy of at least 10 years could benefit from radical prostatectomy (RP), where the robotic approach offers the benefits of minimally invasive surgery. Delayed postoperative bleeding is a serious complication of RP, although rare. Iatrogenic pelvic pseudo-aneurysms following open, robotic or laparoscopic procedures have been rarely reported in the past. The clinical presentation of a bleeding pseudoaneurysm can be diversified and the clinical management of hemorrhage after RP has not been well-described, despite wide institutional and anecdotal experiences.

Keywords: prostate cancer ; pseudoaneurysm ; prostatectomy ; continence ; robotic

1. Diagnosis Assessment

There are only few published cases of postprostatectomy pseudoaneurysms (PPP), generally presenting as late hematuria [1]. The clinical presentation was indeed faceted, but it presents bleeding as its main element. Injured vessels generally dwell in the prostatectomy area, nevertheless the tissue compression in the pelvic space avoids their risk of bleeding, except for large arterial damages or persistent hemorrhages that require intervention [2]. The intraoperative diagnosis still remains a challenge, considering head-down position and pneumoperitoneum during laparoscopic or robotic procedures [3].

The diagnosis of pseudoaneurysm is usually carried out through contrast-enhanced computed tomography (CT), a simple, effective and available exam, less invasive than angiography, that differently represents the best choice when a therapeutic intervention is required [1][4][5]. In a previous report, authors suggested an algorithm based on performing CT as a first step and an immediate angiography if pseudoaneurysm was suspected by CT [3].

Ultrasonography (US) is a valid alternative in consideration of its quick availability, cheapness, fastness, portability and it not requiring appropriate settings. However, its sensitivity is limited and it still remains a full operator-dependent image tool [4]. In evaluating the prostatic lodge, US can take advantage of an endocavitary probe that allows the local percutaneous treatment, where possible [1]. A challenging option is magnetic resonance angiography (MR) with three-dimensional gadolinium-enhanced angiography to evaluate pseudoaneurysms in every projection. Unfortunately, MR is expensive, time consuming and not easy to find everywhere. Furthermore, patients are often connected with medical equipment that are non-compatible with MR system, making their appropriate monitoring or vital function supply difficult [4]. MR use has never been described in a diagnostic path related to pseudoaneurysm after RP.

2. Management

Pseudoaneurysm management can substantially vary, according to the requirements of quickness, invasiveness, tolerance of the different techniques and to the vessel involved.

Bazan et al. described a singular case of pseudoaneurysm visible via transrectal ultrasound, treated with image guided thrombin injection [1]. Another alternative to endovascular treatment is the percutaneous embolization [6], which has been described using coils, thrombin and n-butiyl cyanoacrylate glue. It still remains an interesting option when the catheterization of an artery can be challenging and was described by Gonzalez-Araiza et al. [7]. When the presentation is a severe hemorrhagic shock with unstable hemodynamics, an immediate surgery is mandatory, following all the necessary circulation supports, such as transfusions [8]. Surgical management must be considered also in case of embolization failure [9]. The case was treated through a selective embolization, that represents the most preferred technique [2][3][5][9][10][11], with complete success.

No technique has been shown to be superior or preferrable so far, since the choice depends on the factors mentioned above and the center experience.

3. Global Results

Pseudoaneurysms are extremely rare complications of RP. Patients mean age was 61.19 years, considering that for the 10 patients analyzed by Bonne et al., the mean age reported was 62 and for the two patients of Castelo et al., no age was available. Among the 23 reported patients who underwent prostatectomy, 12 of them received a robotic-assisted approach, eight a retropubic approach (RP) and three patients received a laparoscopic approach (LRP). Surgical approach was intraperitoneal in four cases, extraperitoneal in four cases and not defined in the remaining. Lymphadenectomy was performed in 11 of the 23 patients, was not performed in two of them, and was not specified for four case reports and the two patients by Castelo et al. [9] (**Table 1**).

Table 1. Summary of the works. General data of the patients described: age, type of surgical procedure, lymphadenectomy (LND). RB = robotic; IP = intraperitoneal; EP = extraperitoneal; LP = laparoscopic; RRP = radical retropubic prostatectomy; ND = not described.

N.	Author/Year	Type—Number of Patients	Age	Surgical Approach—Access	LND
1	Beckeley et al., 2007 [10]	Case report—1 patient	55	RB—IP	Yes
2	Lopes et al., 2009 [5]	Case report—2 patients	55–57	LP—EP	ND
3	Feng et al., 2013 [11]	Case report—1 patient	55	RB—ND	Yes
4	Bazan et al., 2014 [1]	Case report—1 patient	56	LP—ND	ND
5	Bonne et al., 2017 [2]	Case series—10 patients	Mean = 62 SD = 6.6 Range = 48.69	RRP	Yes
				RB—IP	No
				RRP	Yes
				RRP	Yes
				RRP	Yes
				RRP	Yes
				RRP	No
				RRP	Yes
				RRP	Yes
				RB—IP	Yes
6	Gonzalez-Araiza et al., 2019 [7]	Case report—1 patient	57	RB—ND	ND
7	Suzuki et al., 2019 [3]	Case report—1 patient	67	RB—IP	No
8	Han et al., 2020 [12]	Case report—1 patient	71	RB—ND	Yes
9	Castelo et al., 2020 [9]	Case report—1 patient (Authors also referred they had three similar cases in total)	61	RB—EP	Yes
10	Fujisaki et al., 2020 [8]	Case report—1 patient	71	RB—IP	Yes
11	Pisano et al., 2021 [6]	Case report—1 patient	60	RB—IP	Yes

The mean time from the operation until the clinical presentation was 26.7 days. For 10 patients, a mean time of 1.5 days between RP and endovascular procedure was reported [2], while for two patients these data are not available [9].

The symptom most frequently described was hematuria, that characterized 36% of cases (nine patients). Anastomotic dehiscence and anemia were equally found in 24% of patients. Lower back pain and peritoneal irritation had the same frequency (8%). More unfrequently reported symptoms were superficial wound infection, abdominal distension, near syncope, hemorrhagic shock, fever and hypogastric pain with a mean prevalence of 4%. For two patients, no clinical signs or symptoms have been described. For a group of 10 patients, authors describe a continuous drop in hemoglobin despite blood transfusion, hypovolemic shock and bloody discharge from an abdominal drainage catheter [2].

The diagnostic tool used to confirm diagnosis was contrast enhanced CT-Scan in 18 patients, arteriography in two cases, not reported in two and surgical exploration in only one.

The most chosen management of pseudoaneurysms was embolization, performed in 22 patients (95.6%): 21 patients benefited from a percutaneous/endovascular approach, and one patient underwent transrectal echo-guided thrombin injection. Only one patient required surgical treatment. All the management strategies were one-shot successful (success rate 100%) and no further handling was required. No cases of death have been reported. One case of venous bleeding was described by Bonne et al. [2] (**Table 2**).

Table 2. Summary of the works. Clinical data of the patients analyzed: time interval between operation and evaluation of pseudoaneurysm, clinical presentation, imaging exams required to perform diagnosis, artery involved and treatment applied. *CT = computed tomography*; *AR = arteriography*; *SE = surgical exploration*; *SE = selective embolization*; *PE = percutaneous embolization*.

N.	Author/Year	Time from Operation until Diagnosis	Clinical Presentation	Diagnostic Tool	Arteries Involved	Therapy Applied
1	Beckeley et al., 2007 [10]	4 Days	Gross hematuria	CT	Left accessory internal pudendal artery	SE
2	Lopes et al., 2009 [5]	20 Days 21 Days	Delayed recurrent hematuria	AR	Left internal pudendal artery Right internal pudendal artery	SE
3	Feng et al., 2013 [11]	4 Weeks	Delayed recurrent hematuria	CT	Accessory pudendal vessel, branch of the left iliac artery	SE
4	Bazan et al., 2014 [1]	15 Days	Hematuria, hypogastric pain, anastomotic dehiscence, anemia, acute urinary retention	CT	Distal branch of the right internal pudendal artery	Transrectal ultrasound guided thrombin injection

N.	Author/Year	Time from Operation until Diagnosis	Clinical Presentation	Diagnostic Tool	Arteries Involved	Therapy Applied
5	Bonne et al., 2017 [2]	4 Days	Continuous drop in hemoglobin despite blood transfusion, hypovolemic shock, bloody discharge from and abdominal drainage catheter	AR	Branch of the left internal pudendal artery	SE
		0 Days			Prostatic branch of the left inferior gluteal artery	
		2 Days			Proximal side branch of the anterior division of the right internal iliac artery	
		0 Days			Right superior vesical artery + inferior vesical artery, left superior vesical artery	
		1 Day		CT	No contrast extravasation identified	
		1 Day			Left inferior vesical artery	
		1 Day			Side branch of the left internal pudendal artery	
		0 Days			Side branch of the right internal pudendal artery	
		5 Days			Side branch of the right internal pudendal artery	
		1 Day			Right external iliac artery	
6	Gonzalez-Araiza et al., 2019 [7]	3 Months	Intermittent gross hematuria	CT	Prostatic resection bed-branch of the right internal iliac artery	PE
7	Suzuki et al., 2019 [3]	11 Days	Fever, hematuria, lower abdominal pain, anemia, peritoneal irritation	CT	Pudendal branch of the left internal iliac artery	SE
8	Han et al., 2020 [12]	6 Days	Near-syncope, abdominal distension, anemia, intermittent hemoperitoneum	CT	Left corona mortis artery	PE
9	Castelo et al., 2020 [9]	15 Days	Hematuria	CT	Internal iliac artery	SE
10	Fujisaki et al., 2020 [8]	80 min	Hemorrhagic shock	SE	Right inferior epigastric artery	Laparotomy
11	Pisano et al., 2021 [6]	12 Weeks	Low back pain with wound infection in the right iliac fossa	CT	Left external iliac—left corona mortis artery	PE

4. Functional Outcomes

Functional outcomes after pseudoaneurysm treatment are unclear, and are reported inconstantly, incompletely and only in some works. Incontinence and erectile disfunction still remain the most feared postoperative complications after radical prostatectomy [13][14].

The internal pudendal artery system as the most frequently involved in pseudoaneurysm development. Since it plays a key role in the erection mechanism, providing high flow for penile tumescence and rigidity, its preservation is critical to ensure residual erectile function after radical prostatectomy [5]. Suzuki et al. stated that excess embolization of the pudendal artery may be responsible for erectile dysfunction, suggesting to prefer selective minimal embolization in order to avoid erectile dysfunction [3].

First, very poor data have been reported about pseudoaneurysm treatment after radical prostatectomy. Second, different managements are further poorly described to compare various approaches. Third, functional outcomes have been described in a different way by each research work making it difficult to set up a statistical analysis. Fourth, to compare functional data, patients also need to be stratified according to disease related risk, tumor grading (extracapsular extension, seminal vesicles involvement, etc.), prostate size, previous prostate or pelvic surgery, previous radiotherapy or androgen deprivation therapy treatment. Fifth, an analysis conducted in this way might also mitigate medico-legal issues. Since sexual disfunction is one of the most common disease processes managed in urology [15], a better understanding of the functional effects of pseudoaneurysm treatment will allow the doctor to mention all the available alternatives and their complications or risks, to consent a patient conscious choice and to prevent all possible forensic litigations [16].

5. Future Functional Assessment

The ideal approach should start with an evaluation of functional baseline status through self-administered and validated questionnaires: IIEF-5 for erectile function [17], IPSS [18], ICIQ-MLUTS [19] and DAN-PSS [20] for continence assessment. In this way, the comparison between baseline and postoperative functional condition can be carried out, and each procedural risk on functional impact might be corrected for all the factors that might affect both continence and the sexual sphere [21]. A multivariate analysis thus constructed would allow a decisional algorithm definition. In this way, the management of this surgical complication can be seriously evaluated in relation to its possible long-term effects, when the patients with pseudoaneurysm do not need an immediate treatment or it is possible to offer them different management strategies. Obviously, treating it in an emergency setting would leave aside functional implications. This strategy would carry out a flowchart algorithm to perform different lines of treatment. The so-called “tailored management” might achieve pseudoaneurysm control, maximizing functional results and avoiding their compromise by a secondary or salvage treatment.

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