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Normal and abnormal MRI findings after abdominal radical trachelectomy (ART) for cervical cancer

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ABSTRACT

Purpose: To report MRI findings after abdominal radical trachelectomy (ART) for early-stage cervical cancer.

Material and Methods: During an 8-year period, 25 women (mean age: 32 years) with biopsy-proven cervical cancer stage ≤IB1, were treated with ART. Postoperative MRI was performed in 22/25 patients, 6 months after ART and every 6 months thereafter, for a total of 6-48 months (mean: 24 months). Normal MRI features of utero-vaginal anastomosis and post-ART complications were recorded by two expert radiologists.

Results: The utero-vaginal anastomosis was clearly depicted on all postoperative MRIs; a vaginal neo-fornix was observed in 17/22 patients. Magnetic susceptibility artefacts caused by the metallic cerclage suture placed at the anastomosis, were more prominent on gradient-echo sequences, partially degrading image quality. Baseline postoperative MRI showed diffuse vaginal wall thickening in 14/22 patients; this gradually resolved within a year from surgery. Asymptomatic lymphoceles occurred in 4/22 patients. Two/22 patients developed symptomatic isthmic stenosis and hematosalpinges, the first 2 years after surgery. In 4/22 patients, hydrosalpinges were discovered incidentally 6 months after ART; one of these patients was diagnosed with pelvic inflammatory disease a year after surgery. Follow-up MRI revealed local tumor relapse in two patients and nodal involvement in one patient, within 2 years after ART.

Conclusion: Post-ART complications observed on MR images of the pelvis include: vaginal wall thickening, lymphoceles, isthmic stenosis, hemato/hydrosalpinges and tumor recurrence. Familiarization of radiologists with the post-ART MRI appearance of utero-vaginal anastomosis is important to avoid misdiagnosis of tumor recurrence.

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1. Introduction

Cervical carcinoma is one of the most common gynecological malignancies worldwide, with a higher incidence among women of reproductive age [1].

In the last decades, the average age of a first pregnancy has increased significantly [2], leading to an increased number of nulliparous young patients with cervical carcinoma, who wish to preserve their fertility. The American Society of Clinical Oncology recommendations (2013) advised clinicians to consider fertility preservation before applying therapy to young women with cervical cancer, to avoid both psychological and physical stress associated with permanent loss of fertility potential [3]. As a result, more conservative surgeries, like radical trachelectomy are reliable alternative options for these women, provided that strict inclusion criteria for the selection of surgical candidates are applied [4]. Trachelectomy can be carried out through a vaginal (VRT) or abdominal (ART) approach. Gynecologists at our institution perform ART combined with pelvic lymphadenectomy for fertility-sparing surgery [5].

Cervical cancer staging is based on clinical guidelines provided by International Federation of Gynecology and Obstetrics (FIGO) [6]. Follow-up of surgically treated cervical cancer patients also relies on clinical evaluation; however, in post-trachelectomy patients, who have an increased risk of tumour recurrence, the isthmic anastomosis is not readily assessed with clinical examination because of the distorted anatomy. Therefore, a reliable imaging method complements clinical work-up and identifies any complications of the procedure [7, 8].

Currently, although not yet officially incorporated to the FIGO classification system, Magnetic Resonance Imaging (MRI) is strongly recommended, not only for the selection of suitable candidates for fertility-sparing therapeutic procedures, but also for monitoring post-trachelectomy patients [8, 9]. ART is a less popular procedure than VRT, however, both techniques share common features and complications [10]. There is a limited number of studies referring to normal and abnormal post-trachelectomy MRI findings [5, 11, 12]. To the best of our knowledge, even though post-ART cases were probably included in the study conducted by Sahdev et al., there is no published literature focusing only on post-ART MRI findings.

In our study, we report our experience from monitoring 22 post-ART patients with dedicated MRI of the pelvis, in order to familiarize radiologists with the normal appearance of the uterovaginal anastomosis and common postoperative complications in this subset of patients.

2. Material and method

2.1 Study group

Institutional Review Board approved and waived informed consent for this prospective/observational study. Revised data from a previously studied population of 19 post-ART patients were included [5].

Within an 8-year period (September 2008-January 2016), 130 women (range: 22-80 years, mean age: 44.7 years) with biopsy-proven invasive cervical cancer and clinical decision for surgical treatment (FIGO stage <IIB) were evaluated in our Radiology Department with dedicated pelvic MRI prior to surgery. None of the patients had received previous treatment (surgery or chemoradiation) for cervical cancer. One of the patients was pregnant (7th week of gestation) at the time of diagnosis.

Inclusion criteria for ART candidates required by our Gynecologic Oncologists include: tumour stage ≤IB1, tumour diameter <4 cm, tumour- internal os distance >5 mm and non-small cell histology. Twenty-seven/130 patients with cervical cancer diagnosis (range: 28-40 years, mean age: 32 years) were found eligible for fertility-preserving surgery; in two patients ART was changed to radical hysterectomy due to intra-operative findings of more advanced disease; the remaining 25 patients were finally treated with ART.

Follow-up MRI data were available in 22/25 post-ART patients; these patients constituted our study group. All 22 patients had their first MRI 6 months after surgery and every 6 months thereafter, for a total of 6-48 months (mean: 24 months). All patients underwent clinical examination, colposcopy and cytology prior to each postoperative MRI.

2.2 MRI protocol

All follow-up pelvic MRI studies were performed with

Table 1. The applied MRI protocol for cervical cancer staging

Sequence	Plane	Technical characteristics
T2-W TSE	Axial (renal hilum-pubis)	TR/TE:3500/90, NSA: 2, SL/G: 4.5/1, Matrix: 340 × 350, FOV: 38
	Sagittal	TR/TE:3500/90, NSA: 3, SL/G:3.5/1.2, Matrix: 348 × 276, FOV: 25
	Axial oblique (perpendicular to cervical axis)	TR/TE: 3900/125, NSA: 6, SL/G: 4/0.4, Matrix: 256/176, FOV: 18
T1-W TSE	Axial (renal hilum-pubis)	TR/TE:400/13, NSA: 1, SL/G: 6/2, Matrix: 300 × 205, FOV: 36
DWI-EPI	Axial	TR/TE:3000/68,NSA:12, SL/G:6/1, Matrix: 124X174, FOV: 35
DCE	Sagittal; one native, post contrast images every 17 s, total acquisition time about 3 min	TR/TE/FA: 15/4.2/45°, NSA: 2 , Matrix: 228 × 75, FOV:17
T2-W TSE FS	Axial	TR/TE:1650/70, NSA: 2, SL/G: 4.5/1, Matrix: 288 × 250, FOV: 35
T1-W FS (SPIR) +/- CE	Axial or sagittal	TR/TE, 400/20, NSA : 2, SL/G : 4.5/1, Matrix :360X252, FOV:38

Abbreviations: *T2-W: T2-weighted, T1-W: T1-weighted, FS: Fat-Suppressed, DCE: Dynamic Contrast-Enhanced, CE: Contrast-Enhanced ,TR (msec): repetition time, TE (msec): echo time, FA (°): flip angle, NSA: Number of Signal Averages, SL (mm): Slice Thickness, G (mm) : interslice Gap, FOV (cm): Field of View (Right-Left)*

a 1.5 T unit (Philips Medical Systems, Eindhoven, The Netherlands); a phased-array dedicated body coil was used in all cases.

In an attempt to limit bowel peristalsis, all patients were instructed to fast for 4-5 h prior to the MRI study and all were administered antiperistaltic agents (hyoscine butyl bromide, 40 mg, *per os*) about 20 min before the exam.

High-resolution turbo spin-echo (TSE) T2-weighted (T2-W) sequences were performed in the sagittal and axial planes. TSE T1- and T2-weighted axial images were also obtained from the pelvis to the renal hilum to assess nodal involvement.

Axial TSE T2-weighted fat-suppressed (TSE-SPAIR) and axial or sagittal diffusion-weighted (DW) images (*b* values: 0, 400, 1,000 s/mm^2) were obtained in only 10/22 patients, since these sequences were not part of our MRI protocol for cervical cancer at the early phase of this study.

All but one patient, who was in early pregnancy, received a bolus intravenous injection of 0.1 mmol/kg gadolinium contrast medium. Dynamic T1-weighted contrast-enhanced images (DCE) in the sagittal plane were obtained every 17 sec for a total of 3 min and were followed by a T1-weighted fat-suppressed sequence in the axial or sagittal plane.

The applied MRI protocol is fully presented in **Table 1.**

2.3 ART description

Twenty-five patients underwent ART and systemic pelvic lymphadenectomy; paraaortic nodal sampling was performed in all >2 cm tumours (*n*=6). ART procedure included removal of the cervix, parametrial tissues (medial portions of the cardinal and uterosacral ligaments) and of the upper 1-2 cm of the vagina through an abdominal approach; ideally, a free from disease proximal endocervix of at least 5 mm is required to technically enable the formation of a utero-vaginal anastomosis and ensure better oncological outcome. Frozen section examination of the cervical specimen and sentinel node was performed during the course of the procedure; only if surgical margins were free of cancer and there was no

nodal involvement, surgeons proceeded with ART. The uterine corpus (preserved isthmus) was anastomosed to the vaginal vault; a permanent metallic suture was placed around the anastomosis to support future pregnancy. Finally, bilateral pelvic lymph node dissection was performed in all cases.

2.4 Image interpretation

All MRI studies were evaluated by two expert radiologists (reader 1: 7 years of experience, reader 2: 25 years of experience) with consensus. All images were reviewed by both readers for the presence of the following:

- an end-to-end anastomosis: *The site of communication between the uterine isthmus and the vaginal vault; if there is a soft-tissue mass abutting the anastomosis, then recurrence is suspected*
- vaginal neo-fornix: *A fold of the posterior vaginal wall extending behind the anastomosis*
- vaginal wall thickening: *Loss of the normally low T2 signal of the vaginal wall; wall oedema may present as an area (focal or diffuse) of high T2 and low T1 signal; subacute vaginal wall hematoma may present as an area (focal or diffuse) of variable T2 and high T1 signal*
- cerclage suture: *A dark, linear structure around the anastomosis on all available sequences, more obvious on gradient-echo images, often causing susceptibility artefact*
- hematometra: *Presence of haemorrhage within the endometrial cavity; when the endometrial cavity is distended with blood products, then isthmic stenosis may be suspected; the signal intensity of haemorrhagic elements depends on the age of haemorrhage*
- dilated tubes (hydrosalpinges): *Tubular structures at the anatomic site of the adnexae; if the content of the tubes is hemorrhagic, then hematosalpinges may be diagnosed*
- postoperative fluid collection(s): *Encapsulated cystic structure within the pelvis; lesion's signal intensity depends on fluid's nature (blood, pus, chyle)*
- lymph node enlargement: *Short axis > 7mm for pelvic lymph nodes; round shape and necrosis within a node were considered additional signs of tumour involvement*

3. Results

3.1 Tumour characteristics

In 12/22 with available follow-up MRIs, tumour size ranged from 0.3 cm to 4 cm (mean: 2.4 cm) on cervical specimen; 6/12 patients had >2 cm tumours; in 10/22 patients with prior conization no residual tumour was detected on final histology. Histological diagnoses included squamous cell carcinoma (*n*=17), adenocarcinoma (*n*=4) and carcinoma of adenosquamous cell origin (*n*=1). Tumour grade was II in 14 patients, I in four and III in another four patients. Lymphovascular space invasion (LVSI) was present in 6/22 patients. Two/22 patients had deep (>50%) cervical stromal invasion on surgicopathological examination. In all patients, surgical stage was ≤I B1.

3.2 Uterovaginal anastomosis

The site of connection between the uterine corpus and the vaginal remnant (end-to-end or utero-vaginal anastomosis) was clearly visualized on all postoperative MRIs. Neo-fornix was observed in 17/22 (77.3%) patients.

Magnetic susceptibility artefacts caused by the metallic cerclage suture at the level of the anastomosis, were detected in 8/22 (36.4%) patients on gradient-echo images, mildly distorting image quality, without affecting overall image interpretation.

Baseline postoperative MRI showed diffuse thickening of the remaining vaginal wall in 14/22 (63.6%) patients with gradual resolution on follow-up studies within one year after ART.

3.3 Lymphoceles

Lymphoceles were observed in 4/22 (18.2%) post-ART patients along the external iliac node chain; in 1/4 patients they were bilateral. Mean size was 3 cm. All patients were asymptomatic and all lymphoceles decreased in size on serial follow-up MRIs. In one patient, a unilateral lymphocele resolved four years after ART.

3.4 Isthmic stenosis

In 2/22 (9%) patients MRIs showed isthmic stenosis and hematosalpinges within 2 years after ART; both patients complained of dysmenorrhea and prolonged menstruation and both underwent repeated dilatations.

3.5 Hydrosalpinges

In 4/22 (18.2%) post-ART patients, hydrosalpinges were discovered incidentally six months after ART; one of these patients, with a history of endometriosis, had an episode of pelvic inflammatory disease requiring surgical drainage, a year after surgery.

3.6 Recurrence

Follow-up MRI revealed local tumour relapse in 2/22

(9%) patients and lymph node metastases in 1/22 (4.5%) patients, within two years after ART.

In the first patient, cone biopsy prior to surgery showed a squamous cell, grade II, FIGO IA2 cervical cancer; no residual tumour was present on preoperative MRI or final specimen; tumour recurred in the parametria, two years after ART. The patient was treated successfully with chemoradiation.

The second patient had an adenosquamous, grade II, 2cm FIGO IB1 cervical tumour; surgical margins were clear and there was no parametrial extension or nodal metastases at surgicopathological examination. Follow-up MRI, six months after post-ART showed recurrent tumour extending from the anastomosis to the lower vaginal wall, involving the pelvic floor. The patient received chemotherapy, external radiation and brachytherapy with complete tumour resolution initially but with tumour relapse a year after treatment. The patient was then treated with pelvic exenteration with poor results and passed away three years after ART.

The third patient had a squamous cell, grade II, 4 cm FIGO IB1 tumour of the cervix; deep stromal but no parametrial invasion or pelvic /paraaortic lymph node involvement was found on final histology. Post-ART MRI at six months, showed a small (short axis=6 mm) left common iliac node, which increased in size (short axis=1 cm) with evidence of central necrosis, a year after surgery. High FDG uptake on positron-emission/computed tomography (PET-CT) images confirmed malignant involvement of the node. The patient was treated with combined chemoradiation; all follow-up MRIs four years after therapy were negative for recurrence.

3.6 MRI follow-up post-ART performed during pregnancy

In one of our study patients, ART was performed in the 14th week of gestation; the patient had an uneventful postoperative course. Follow-up MRI at week 34, showed extensive vaginal oedema, a large lympocele, but no evidence of tumour relapse. At week 36, delivery was performed through caesarean section, followed by radical hysterectomy and pelvic lymphadenectomy. Serial follow-up MRIs within two years after hysterectomy were negative for recurrence.

4. Discussion

Currently, radical trachelectomy is considered an alternative option for patients with cervical cancer who wish to keep fertility potential, with acceptable obstetrical and oncological outcomes. Abdominal radical trachelectomy (ART) is a more aggressive procedure than vaginal radical trachelectomy (VRT) and it may, therefore be applied to tumours >2 cm since it includes a wide resection of the parametrial tissue and the upper vagina, equivalent to that achieved by abdominal radical hysterectomy (ARH). However, postoperative morbidity is significantly increased in ART compared to VRT and ARH patients [13].

Typical follow-up, for cervical cancer patients treated with surgery including ART, consists of clinical and colposcopical examination and Pap-smear cytology every 3 - 4 months for the first two years, and every six months thereafter, for a total of five years. Some centers also recommend follow-up every year after the first five years [14]. However, both bimanual clinical examination and colposcopy may have difficulty in evaluating post-ART patients due to distorted anatomy. Furthermore, atypical cells may be found in a significant number of smears leading to false-positive results for tumour recurrence [15]. Therefore, most Gynecologic Oncologists advocate the use of imaging for monitoring trachelectomy patients; at our institution, follow-up MRI is recommended every six months, for a total of 24 months post-ART.

There are only a few studies focusing on post-trachelectomy MRI findings and most of them include cases treated with VRT [11, 12, 16]. Reported normal post-ART MRI findings include: an end-to-end anastomosis of the uterine isthmus to the remaining vagina with or without the presence of a cerclage suture, a posterior neo-vaginal fornix, diffuse vaginal wall thickening which may persist up to a year after surgery and slowly-absorbed vaginal wall hematomas.

Sahdev et al. reported that the end-to-end anastomosis between the corpus and vagina was visualized in only in 44% of 45 post-trachelectomy patients [11]; however, in our study, the uterovaginal anastomosis was clearly seen in all patients **(Fig. 1)**. In accordance to previous studies [11, 12], a posterior fold of the vaginal wall, known as neo-posterior vaginal fornix or neo-fornix, was demonstrated in more than half of our study patients; knowledge of this variant is important because, neo-fornix may be imaged on MRI as a soft tissue mass behind the anastomosis and it can be easily mistaken for recurrent disease; normal signal intensity of the "mass" and lack of change

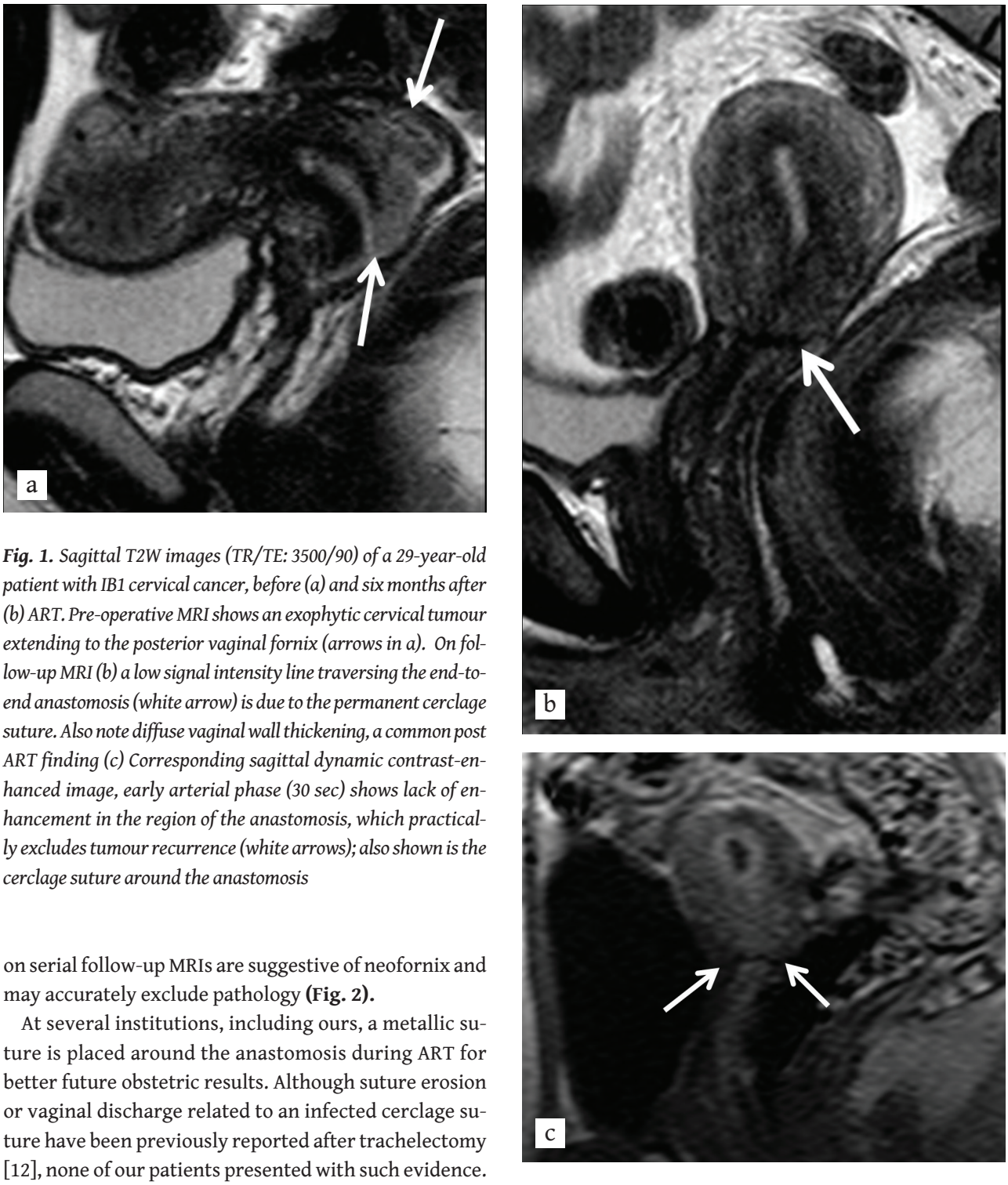

Fig. 1. *Sagittal T2W images (TR/TE: 3500/90) of a 29-year-old patient with IB1 cervical cancer, before (a) and six months after (b) ART. Pre-operative MRI shows an exophytic cervical tumour extending to the posterior vaginal fornix (arrows in a). On follow-up MRI (b) a low signal intensity line traversing the end-to-end anastomosis (white arrow) is due to the permanent cerclage suture. Also note diffuse vaginal wall thickening, a common post ART finding (c) Corresponding sagittal dynamic contrast-enhanced image, early arterial phase (30 sec) shows lack of enhancement in the region of the anastomosis, which practically excludes tumour recurrence (white arrows); also shown is the cerclage suture around the anastomosis*

on serial follow-up MRIs are suggestive of neofornix and may accurately exclude pathology **(Fig. 2).**

At several institutions, including ours, a metallic suture is placed around the anastomosis during ART for better future obstetric results. Although suture erosion or vaginal discharge related to an infected cerclage suture have been previously reported after trachelectomy [12], none of our patients presented with such evidence. The use of an anastomotic metallic suture may produce susceptibility artefacts on MR images, more prominent on gradient-echo sequences. In our study, susceptibility artefacts, were noted mostly on the DCE sequence, partially compromising its quality. However, we agree that overall this artefact rarely poses a problem during imaging interpretation.

Diffuse vaginal wall thickening has been reported after trachelectomy and is likely due to edema and/or hematoma related to the resection of the adjacent paravaginal/parametrial tissue. It appears in the early postoperative period but it may persist on follow-up studies for over a year. In the series by Sahdev et al., postoperative

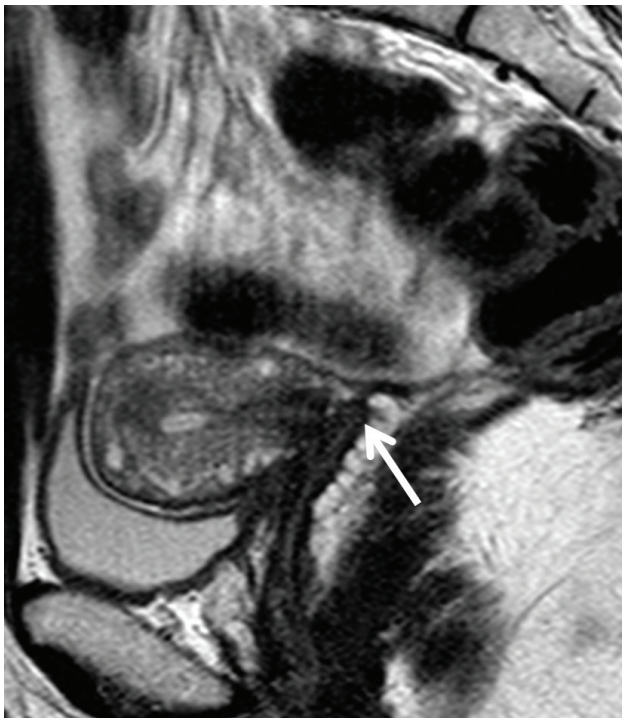

Fig. 2. *Sagittal T2W image (TR/TE: 3500/90) of a 32-year-old patient, a year after ART. Neo-fornix is demonstrated as a low signal intensity fold extending behind the uterovaginal anastomosis (arrow)*

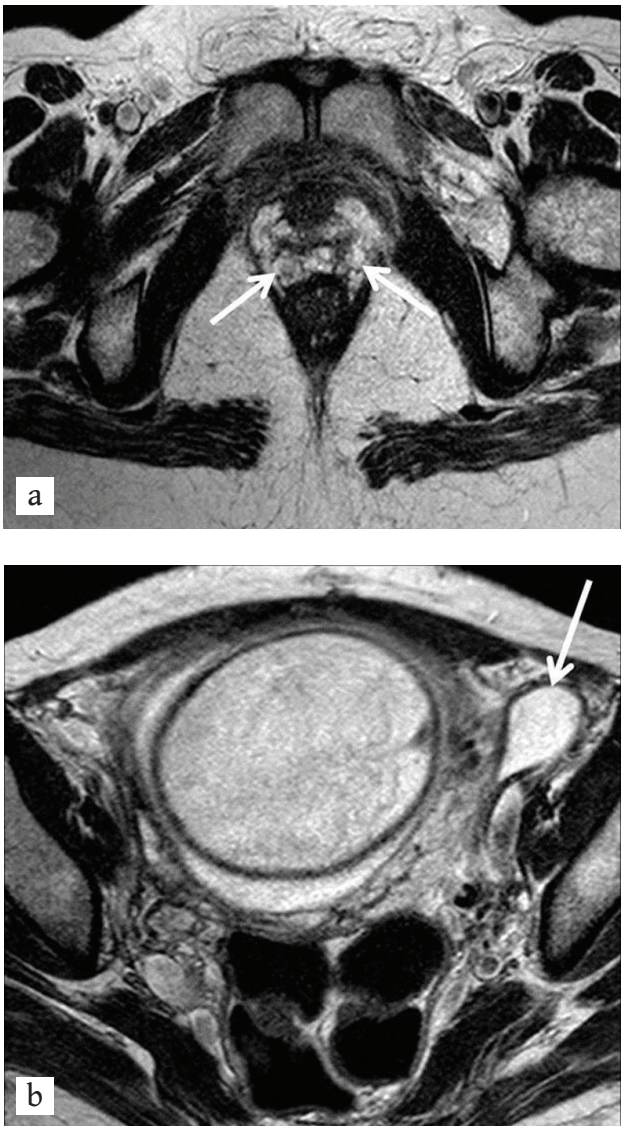

Fig. 3. *Axial T2W MR images (TR/TE: 3500/90) of a 30-year-old pregnant patient five months after ART. Extensive vaginal wall edema (arrows in a) and a 3 cm lymphocele (arrow in b) are shown*

diffuse vaginal wall edema and focal vaginal hematoma was reported in 7% and 4% of the patients, respectively [11]. In our study, diffuse vaginal wall thickening was seen in over half of our patients but, in all cases, it resolved within the first year **(Fig. 3a).** We did not observe any vaginal wall hematoma in our patients. The higher incidence of vaginal hematomas on study by Sahdev et al. may be attributed to a vaginal rather than abdominal trachelectomy approach, although this not made clear in their manuscript [11]. Discrimination between extensive edema/hematoma and diffuse cancerous infiltration of the vaginal wall may be difficult, as both will show high signal intensity on T2-weighted (T2-w) images. High signal intensity of the abnormal wall on T1-weighted (T1-w) images, no restriction of diffusivity on high *b*-value diffusion-weighted images (DWI) and no enhancement on post-contrast sequences are helpful signs for excluding relapse of tumour.

Reported post-ART complications include lymphoceles, isthmic stenosis, hydrosalpinges and infection/abscess [5, 11, 12]. Lymphoceles are a common finding after extensive pelvic nodal dissection occurring in up to 25% of patients after trachelectomy [11, 12]. They are usually asymptomatic, but they may grow and displace neighboring pelvic structures. Infrequently, lymphoceles become infected and surgical or percutaneous drainage may be required. In most cases, though, they spontaneously regress. Typical MRI findings include an encapsulated fluid collection, with or without septations, usually located along the external iliac vessels, with high signal

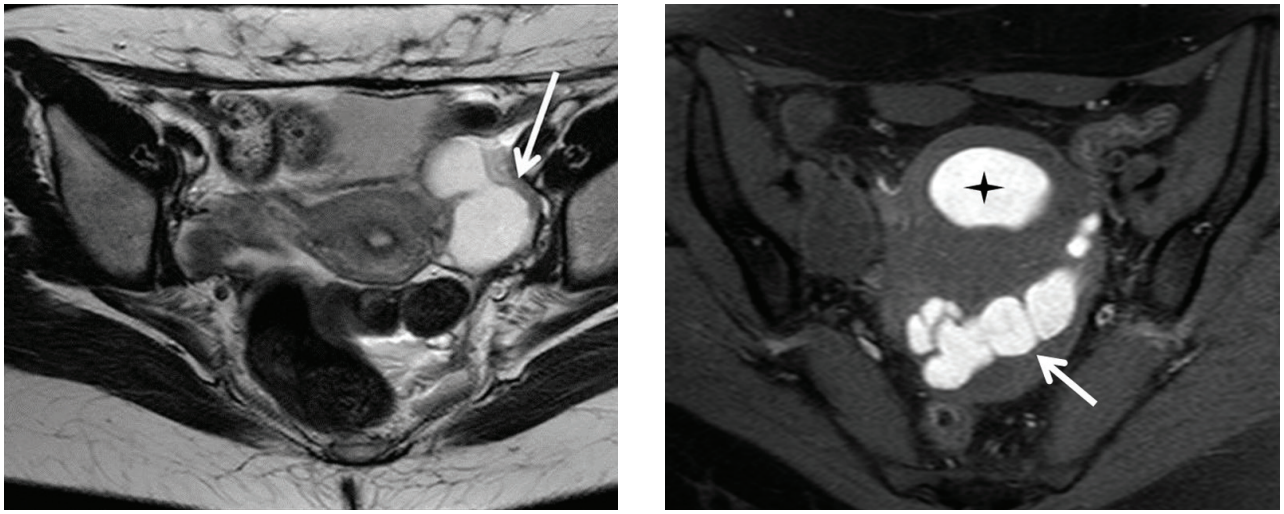

Fig. 4. *Axial T2W MR image (TR/TE: 3500/90) of a 29-year-old asymptomatic woman 6 months post ART (a). Note left hydrosalpinx (arrow). (b) Axial T1 fat-suppressed (SPIR) image (TR/TE: 400/20) of a 34-year-old post ART patient shows the presence of hematosaplinx on the left side of the pelvis (arrow). Hematometra is also evident due to severe isthmic stenosis (asterisk)*

intensity on T2-w images, variable signal intensity on T1-w images and mild wall enhancement on post-contrast images **(Fig. 3b)**. Lymphocele formation was detected in four of our study patients and it was bilateral in two. In all four cases, lymphoceles did not pose a diagnostic problem. They all decreased in size gradually and in one patient they resolved four years after ART.

Isthmic stenosis is considered an important post-trachelectomy complication as it may significantly compromise patients' quality of life. Secondary amenorrhea, pelvic pain and development of endometriosis may occur in cases of severe isthmic stenosis. It was observed in two of our patients who complained of prolonged and painful menstruation. MRI showed a distended with hemorrhagic fluid endometrial cavity and unilateral hematosalpinx in both patients. Treatment consisted of repeated dilatations.

We observed hydrosalpinx formation in 4/19 of our post-ART patients **(Fig. 4)**. In all four patients, hydrosalpinx was detected as a tubular non-enhancing fluid-filled structure on MRI six months after trachelectomy. They all persisted on follow-up MRIs (mean: 18 months). In 1/4 patient, with known history of endometriosis, severe pelvic inflammatory disease requiring surgical treatment developed a year after ART. There are no other reports of hydrosalpinges formation after trachelectomy in the literature; however, most published descriptions of post-trachelectomy MRI findings refer to VRT and not ART. A possible explanation for the formation of hydrosalpinges after ART may be the more extensive removal of parametrial tissues compared to VRT, which may predispose for the development of postoperative adhesions. The presence of hydrosalpinges on post-ART MRIs is of particular importance because of the increased risk for infection and the potential compromise of the patient's reproductive potential.

The rate of tumour recurrence in patients treated with ART is relatively low (<4%) [10]. Early detection of recurrence is important to ensure good prognosis. In most cases, tumour recurs in the early post-trachelectomy period (12–18 months); usual sites of relapse, include the vaginal vault, parametrium or pelvic sidewall (40%) and the pelvic, paraaortic or less often supraclavicular lymph nodes (25%–30%) [12, 17]. Adverse prognosticators for tumour recurrence after radical trachelectomy include: tumour size >2 cm, deep (>50%) stromal invasion and extensive lymphovascular space invasion (LVSI) [10]. In our study, tumour recurred in 3/22 patients with available follow-up MRIs **(Fig. 5)**. The relatively high number of patients with relapse in our study may partly be explained by the fact that initial tumour size in one of the three patients was 4 cm; most investigators perform trachelectomy for tumours with a maximal diameter ≤2 cm. The remaining two patients with tumour recurrence had no known adverse prognostic factors.

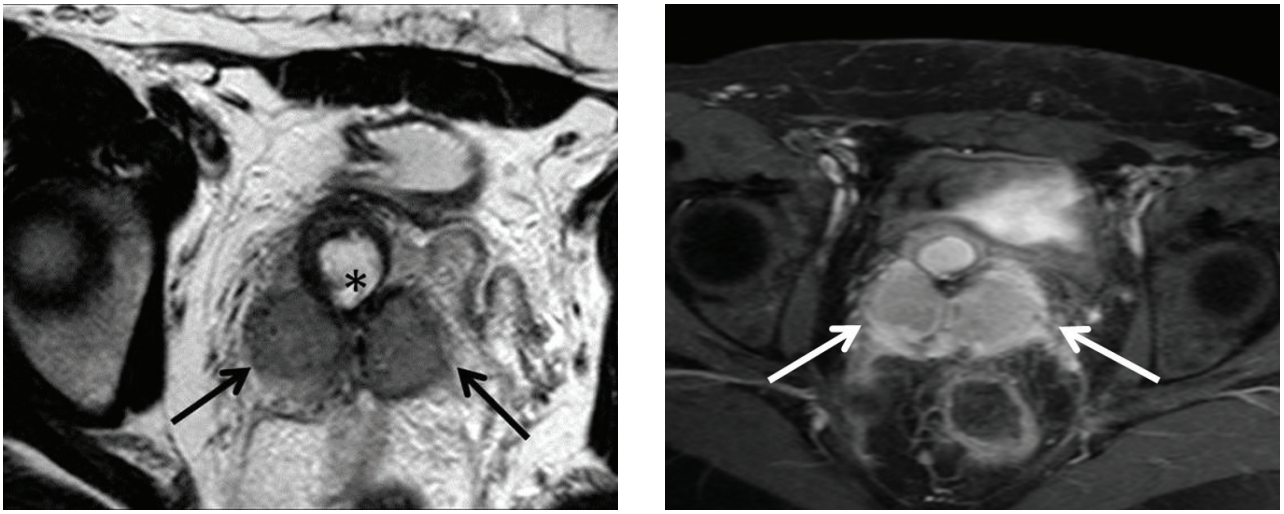

Fig. 5. *(a) Axial T2W MR image (TR/TE: 3500/90) of a 31-year-old patient, 6 months after ART. There is a soft- tissue mass (arrows) abutting the uterovaginal anastomosis (asterisk) (b) Corresponding axial T1 fat-suppressed contrast-enhanced image (TR/TE: 400/20), shows strong enhancement of the mass (arrows). Biopsy was positive for tumour recurrence*

Finally, there is limited information in the literature regarding MRI findings in post-ART pregnant patients [18]; in our study, follow-up MRI of a pregnant patient treated with ART for cervical cancer during her pregnancy, at week 34 of gestation, showed diffuse thickening of the vaginal wall with high T2 signal. MRI evaluation of the uterovaginal anastomosis was difficult due to the gravid uterus and artefacts related to fetal movement; absence of restricted diffusion on DWI suggested the diagnosis of postsurgical changes and not local tumour recurrence. Fetal or bowel movements, the presence of a metallic suture or postoperative blood products may potentially influence the diffusivity at the anastomosis; however, most of the times, such artifacts on DW images do not pose a problem, as they lack restriction on high *b* value images. After delivery, the patient underwent radical hysterectomy and pelvic lymphadenectomy with no residual cancer on final histology.

Our study had some limitations. Firstly, our study population (n=22) accumulated over a 8-year period is small and, therefore, no strong statistical data could be obtained; most, however, reported post-trachelectomy series refer to VRT, with a limited number of ART cases reported worldwide [9-12, 19, 20]. Several protocol upgrades have been applied at our Department during the eight years of our study, and this may have affected the consistency of image interpretation. The radiologists who participated in our study were both experienced in female pelvic imaging; results could have been different, if general radiologists interpreted the findings. However, as with pre-operative evaluation, interpretation of post-trachelectomy MRIs requires expertise to optimize results.

5. Conclusion

MRI is a reliable tool for monitoring patients after abdominal radical trachelectomy. Tumour recurrence may be accurately detected on post-ART MRI, but familiarization of radiologists with normal post-ART appearance of the uterus and common postoperative complications, such as edema of the vaginal wall, lymphoceles, isthmic stenosis and hydrosalpinges is important to avoid misdiagnosis and to enhance future fertility outcome. R

Conflict of interest:
The authors declared no conflicts of interest.

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