Radiology Case Reports 19 (2024) 2143–2150

Available online at www.sciencedirect.com

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Case Report

Benign and malignant prolapsed uterine tumors : 4 case reports of an extremely rare entities ☆

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ARTICLE INFO

Article history:
Received 9 February 2024
Revised 15 February 2024
Accepted 20 February 2024
Available online 11 March 2024

Keywords:
Leiomyoma
Sarcoma
Adenocarcinoma
MRI
Broccoli sign

ABSTRACT

Prolapsed uterine tumors within the cervix or vagina, are attached to the uterine cavity by a soft tissue stalk. Malignant tumors and leiomyoma are the first diagnostic considerations for a prolapsed uterine mass with a visible stalk at MRI. This article describes 4 cases of patients who presented with large, necrotic prolapsed uterine tumors that were surgically confirmed and were diagnosed prospectively on the basis of MRI findings. Imaging, particularly MRI, plays a crucial role in the management of patients with prolapsed pedunculated uterine tumors, especially for pre-operative localization and surgical treatment. The 4 patients underwent a total hysterectomy with a complete resection of the mass. The histopathological report confirmed in the first case the diagnosis of a uterine leiomyoma with aseptic necrobiosis, in the second and third cases a sarcoma, and in the fourth case a serous adenocarcinoma.

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Introduction

Prolapsed uterine tumors may be connected to the uterine cavity by a soft tissue stalk composed of vascular structures and connective tissue [1].

The combination of a stalk with a prolapsed tumor mass results in a characteristic morphology called the « Broccoli sign » [2]. This sign usually refers to a uterine tumor rather than cervical cancer [1].

Submucosal leiomyomas are the most common tumors to prolapse through the cervix; other tumors that have been reported to prolapse into the cervix include adenomyoma, adenosarcoma, and endometrial carcinoma [1,3].

The role of MRI is to prospectively analyze the nature and morphology of the tumor and outline the stalk and uterine attachment of the prolapsed mass, which can be useful to guide surgical treatment.

Four interesting cases of prolapsed pedunculated uterine tumors are reported in order to prove that magnetic resonance

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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https://doi.org/10.1016/j.radcr.2024.02.072

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imaging (MRI) is essential to narrow the differential diagnosis by describing the morphology and the origin of a mass, to perform adequate presurgical planning, and to help with the distinction between benign and malignant masses. In our first case, MRI and histopathological examination confirmed submucosal leiomyoma with aseptic necrobisis with no evidence of a malignancy, while in the second and third cases, it confirmed the diagnosis of uterine sarcoma, and in our fourth case, the tumor was a serous adenocarcinoma.

Case presentation

Case 1

A 48-year-old woman, gravida 2, parity 2, in her perimenopausal period with no significant medical history, was admitted to our hospital with the following complaints: Lower abdominal pain with intermenstrual bleeding for 4 months.

The general examination was unremarkable; blood pressure was 120/80 mmHg, pulse rate was 80 beats per minute, and respiratory rate was 22 cycles per minute.

The abdominal examination was normal. In the pelvic exam, an 8 x 8 cm solid, ulcerated, and necrotic mass was protruding in the vagina through the cervix; the body of the cervix could not be visualized separate from the mass.

Laboratory tests showed moderate anemia; her hemoglobin level was 10 g/dL. No platelet count or coagulation abnormalities were observed, and no abnormalities were noted in other biochemical tests.

Transvaginal ultrasonographic examination could not be performed because of the unreducible, painful vaginal mass.

Our patient had a computed tomography (CT), which showed a low-density, pedunculated, well-circumscribed tumor in the cervical lumen and vagina of 9 × 8 cm, connected to the myometre with a long stalk of 5 cm, that has a posterior corporeal uterine attachment point, slightly enhanced after contrast (Fig. 1).

Pelvic magnetic resonance imaging (MRI) was performed in the 3 planes following the EG T2 balance, diffusion-weighted imaging (DWI), and dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI). It revealed a large pedunculated lobulated mass prolapsing from the uterus, distending the cervix and vaginal cavity measuring 9 × 8 cm and connected to the myometrium with a long stalk of 4.5 cm, containing thin linear structures that showed low signal on T1 and T2-weighted images, which created a « broccoli-like » appearance (Fig. 2).

The prolapsed mass shows heterogeneous signal intensity on the T2-weighted images with peripheric hemorrhagic deposits that are hyperintense on T1-weighted images and diffusion, but the DWI showed no true restricted diffusion in the bulky mass (Fig. 2).

The tumor shows progressive heterogeneous enhancement parallel to the uterine myometrium on the DCE images (Fig. 3).

These results indicated a prolapsed submucous leiomyoma with aseptic necrosis.

The surgical procedure consisted of two phases: first, the myomectomy was performed vaginally, and then the hysterectomy was done with a laparotomy.

Histopathological examination confirmed the diagnosis of submucosal leiomyoma with aseptic necrobiosis, and there was no evidence of malignancy.

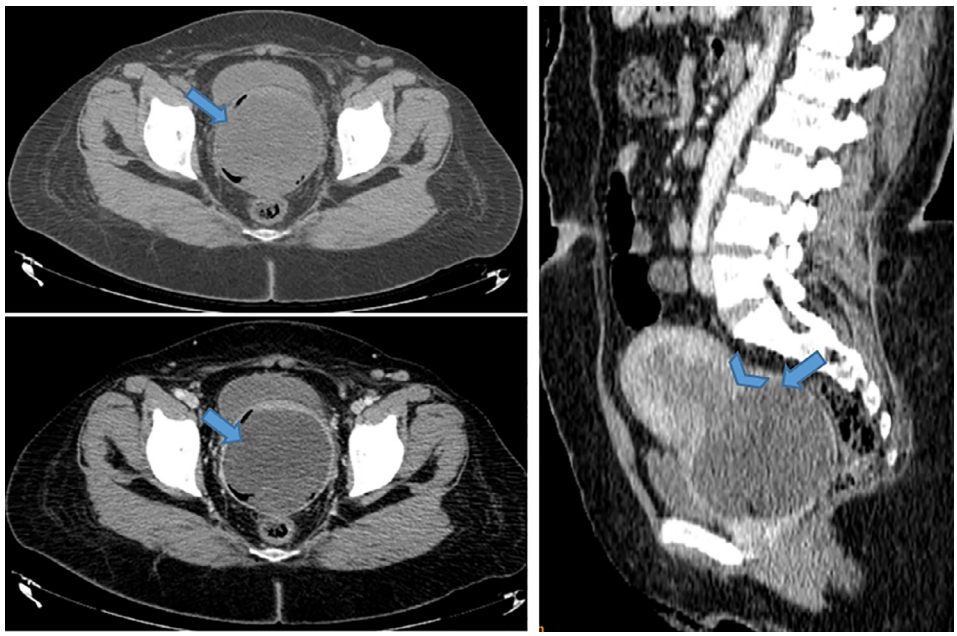

Fig. 1 – Axial and sagittal CT images showing a bulky mass (Arrow) distending the cervix and the vaginal cavity connected to the uterus with a long stalk that has a posterior corporeal attachement point (Arrow head). The mass shows diffuse low attenuation with poor enhancement.

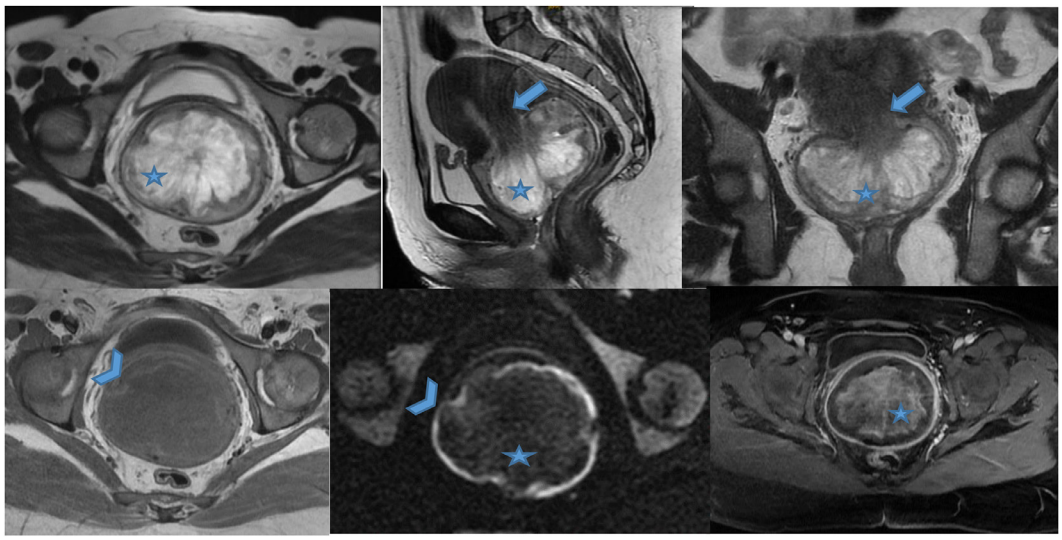

Fig. 2 – Pelvic MRI (T2 in 3 planes, T1 without Fat Sat, DWI and T1 with Fat Sat after injection of Gadolinium) : A huge vaginal mass with heterogeneous signal intensity with no restricted diffusion (Asterix), connected to the endometrial cavity by a stalk (Arrow) Peripheric hemorrhagic deposits that are hyperintense on T1-weighted images and diffusion (Arrow head).

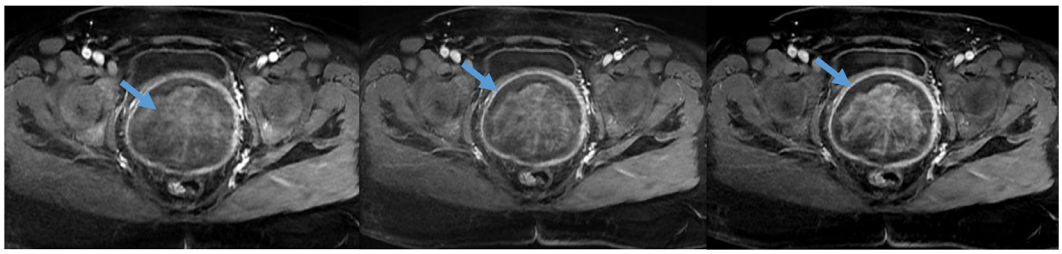

Fig. 3 – Pelvic dynamic contrast-enhanced MRI shows progressive heterogeneous enhancement (Arrow).

The patient recovered eventually with no post-op complications and was discharged in a stable condition.

Case 2

A 69-year-old menopausal woman, gravida 5, parity 5, visited our hospital for vaginal spotting and malodorous leucorrohea for several weeks. She had no significant medical history.

A gynecologic examination revealed a protruding vaginal necrotic mass measuring 6 cm, with streaks of blood coming from the endocervix and malodorant leucorrhoea, but the origin of the mass and its relationship with the uterus were ambiguous.

Laboratory tests showed moderate anemia; her hemoglobin level was 11 g/dL. No platelet count or coagulation abnormalities were observed, and no abnormalities were noted in other biochemical tests.

Transvaginal ultrasonographic examination could not be performed because of the unreducible and tender vaginal mass.

CT scan showed a large heterogeneous mass involving the lower uterine body and filling the cervix and vaginal cavity, with a long stalk that has a posterior corporeal uterine attachment point. The mass showed low attenuation, with heterogeneous enhancement (Fig. 4).

The origin of the mass was more accurately distinguished by MR imaging. The mass had a long stalk of 4 cm connected to the uterine cavity, with a posterior corporeal uterine attachment point of 2 cm, creating « Broccoli-like » appearance. The stalk contained thin linear structures that showed low signal intensity on both the T1- and T2-weighted images, and the prolapsed tumor showed lobulated high heterogeneous signal intensity on the T2-weighted image, restricted diffusion with heterogeneous and intense enhancement on the DCE images, measuring 6 × 6 cm. The mass was suspected of being a prolapsed, huge uterine sarcoma.

There was also a second uterine mass occupying the uterine fundus with the same characteristics, measuring 3 × 3 cm (Fig. 5).

Biopsy of the prolapsed mass with anatomopathological examination confirmed the diagnosis of sarcoma.

The prolapsed mass was resected transvaginal and then a total abdominal hysterectomy with bilateral annexectomy was performed.

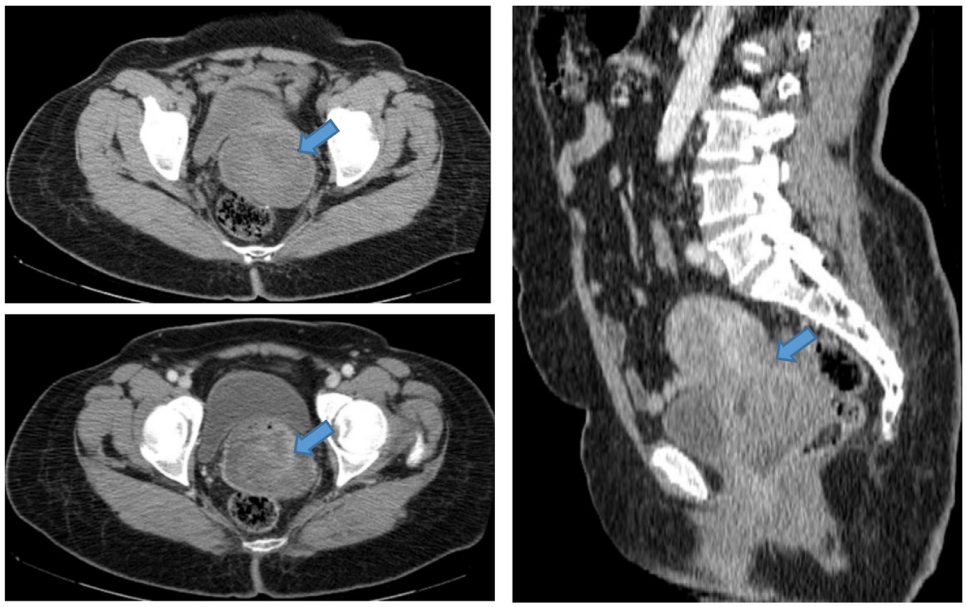

Fig. 4 – Axial and sagittal CT images showing a mass involving the lower uterine body and cervix and filling the vaginal cavity connected to the uterus, showing diffuse low attenuation with heterogenous enhancement (Arrow).

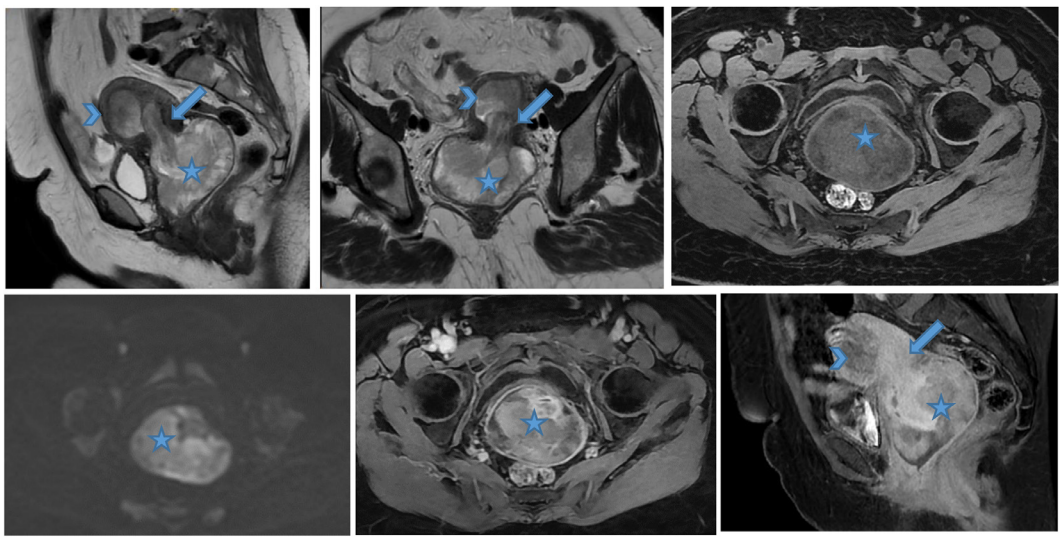

Fig. 5 – Pelvic MRI (T2 sagittal, axial, T1 Fat Sat, DWI, T1 Fat Sat after injection of Gadolinium axial and sagittal) shows a vaginal mass (asterisk) connected to the endometrial cavity by a stalk (arrow), producing an overall "broccoli" configuration. The second uterine mass occupying the uterine cavity with the same signal characteristics (Arrow head).

The pathologic results of the prolapsed mass were rhabdomyosarcoma while the fundus uterine tumor was carcinosarcoma.

The patient fully recovered and was discharged in a stable condition with no post-op complications.

Case 3

A 72-year-old menopausal woman, gravida 4, parity 4, with no notable medical history, was admitted to our hospital with the following complaints: Lower abdominal pain with metrorrhagia for 6 months.

The patient's blood pressure, pulse rate, and respiration rate were all within normal ranges : 130/70 mmHg, 70 beats per minute, and 24 cycles per minute. The abdominal examination was normal.

In the pelvic exam, a 4 x 3 cm solid and necrotic mass was protruding in the vaginal cavity through the cervix; the body of the cervix could not be visualized separately from the mass.

Laboratory tests showed moderate anemia; her hemoglobin level was 10.5 g/dL. No platelet count or coagulation abnormalities were observed, and no abnormalities were noted in other biochemical tests.

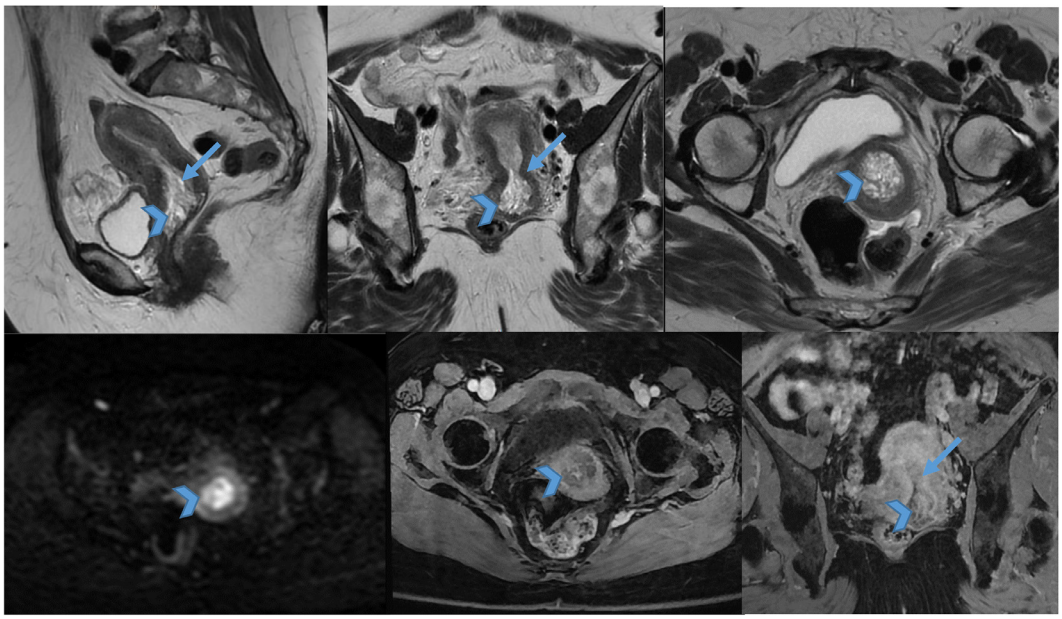

Fig. 6 – Pelvic MRI (T2 in three planes, DWI, T1 Fat Sat after injection of Gadolinium axial and coronal) shows a vaginal mass (arrow head) connected to the uterine cavity by a stalk (arrow).

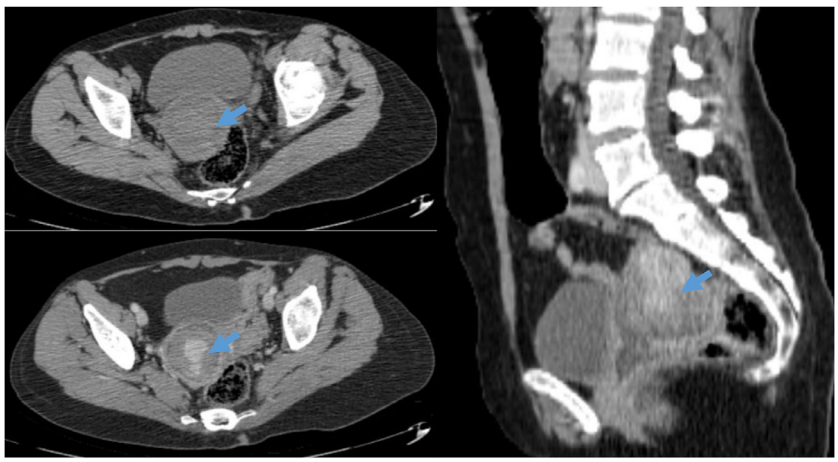

Fig. 7 – Axial and sagittal CT images demonstrates a mass involving the uterine body prolapsed through the cervix and filling the vaginal cavity, showing heterogeonous low attenuation with intense heterogenous enhancement (Arrow).

Transvaginal ultrasonographic examination could not be performed because of the unreducible vaginal mass.

Our patient had an MRI, which showed a pedunculated tumor in the cervical lumen and vaginal cavity of 4 × 3 cm, connected to the uterine cavity with a long stalk of 3 cm, that has an anterior corporeal uterine attachment point of 2 cm, with a « Broccoli-like » appearance (Fig. 6).

The prolapsed tumor shows high heterogeneous signal intensity on the T2-weighted image, restricted diffusion with heterogoneous and intense enhancement on the DCE images. The mass was suspected of being a prolapsed uterine sarcoma.

Biopsy of the prolapsed mass with anatomopathological examination confirmed the diagnosis of adenosarcoma.

The tumor was resected transvaginally, and then a total abdominal hysterectomy with bilateral annexectomy was performed.

The pathologic results of the prolapsed mass confirmed it was an adenosarcoma.

After achieving complete recovery, the patient was released in a stable state with no post-op complications.

Case 4

A 50-year-old menopausal woman, gravida 2, parity 2, with no particular medical history, visited our hospital for metrorrhagia and malodorous leucorrohea for 3 months.

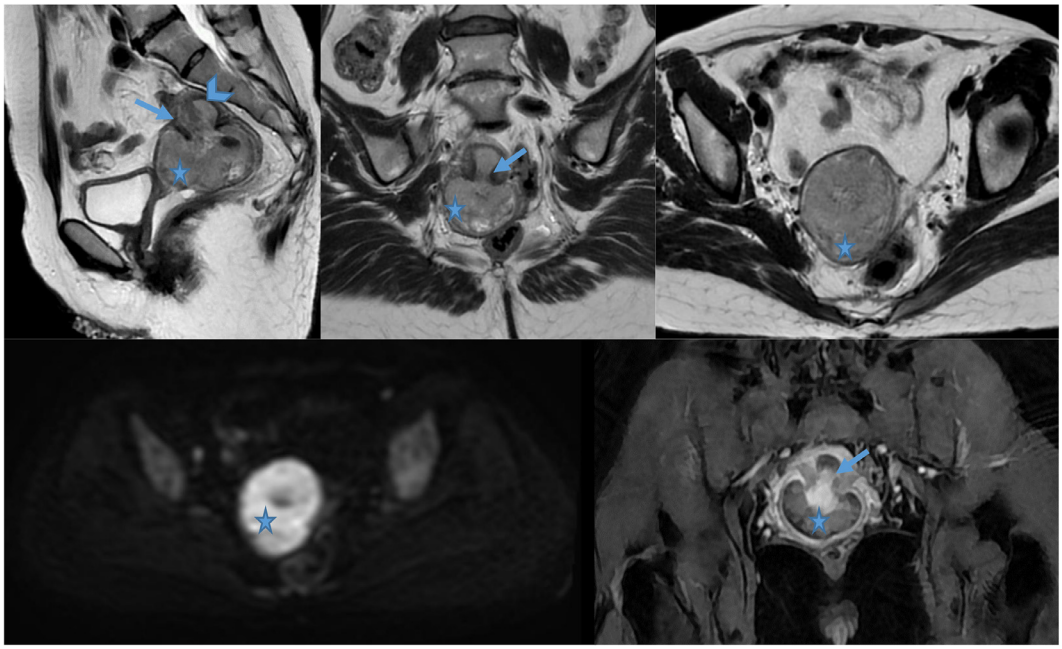

Fig. 8 – Pelvic MRI (T2 in three planes, DWI and T1 Fat Sat after injection of Gadolinium) : Heterogeneous tumor filling the cervix and vaginal cavity (Asterix) with a long stalk connected to the uterus (Arrow), creating a « Broccoli-like » appearance. Endometrial thickening (Arrow head).

A gynecologic examination revealed a protruding vaginal necrotic mass measuring 5 cm with streaks of blood and malodorant leucorrhoea, but the origin of the mass and its relationship with the uterus were ambiguous.

No blood count or coagulation abnormalities were observed.

Transvaginal ultrasonographic examination could not be performed because of the irreducible and painful vaginal mass.

CT scan showed a large heterogeneous mass involving the lower uterine body extending to the cervix and vaginal cavity, with a long stalk, that has an attachment point in the fundus of the uterus. The mass showed low attenuation, with intense and heterogeneous enhancement (Fig. 7).

MRI showed a large heterogeneous mass filling the vaginal cavity with a long stalk of 2.5 cm connected to the uterine cavity, that has an anterior corporeal uterine attachment point of 1.5 cm, with a « Broccoli-like » appearance.

The stalk contained thin linear structures that showed low signal intensity on both the T1- and T2-weighted images, and the prolapsed tumor showed high heterogeneous signal intensity on the T2-weighted image, restricted diffusion with heterogeneous and intense enhancement on the DCE images, measuring 5 × 6 cm. The mass was suspected of being a prolapsed malignant uterine tumor (Fig. 8).

MRI also showed endometrial thickening measuring 7 mm.

Biopsy of the prolapsed mass with anatomopathological examination showed serous adenocarcinoma.

The prolapsed mass was resected transvaginal, and then a total abdominal hysterectomy with bilateral annexectomy, bilateral pelvic lymphadenectomy, and para-aortic lymphadenectomy was performed with multiple peritoneal cytology and biopsies.

The pathologic results of the prolapsed mass confirmed the diagnosis of serous adenocarcinoma with clear cells components.

The patient was discharged in a stable condition with no post-op complications.

Discussion

I. « Broccoli sign » :

The « Broccoli sign » which appears as a stalk connecting an apparent cervical mass to the uterine cavity on CT or MR imaging, supports the diagnosis of a prolapsed uterine tumor [1].

This so-called « Broccoli sign » is often the first sign that the tumor is a prolapsed uterine mass and has been primarily described in the setting of prolapsed leiomyomas or uterine malignancies such as endometrioid adenocarcinoma and sarcoma [2].

These prolapsed masses may present with bleeding, and the physical examination of a mass in the upper vagina may result in an initial clinical diagnosis of cervical tumor [2].

Prolapsed uterine tumors can mimic cervical cancer both clinically and radiologically [1].

Imaging shows intra-cavitary uterine tumor following the “path of least resistance” and prolapsing downstream through the cervix [1].

The Broccoli sign is a characteristic morphology that combines a stalk and prolapsed tumor and appears on sagittal CT or MRI images as a lobulated vaginal mass connected to the endometrial cavity by a long stalk [4].

It is important to recognize that the « Broccoli sign » is meant to help narrow the differential diagnosis by describing the origin of a tumor.

II. Leiomyoma :

Leiomyoma is the most frequent benign neoplasm of the uterus, with a prevalence of 40% at 35 years in Caucasian women, with a peak incidence between the ages of 35 and 40 [5]. In our first case, the patient was a bit older : 48-year-old female in her peri-menopausal period.

Prolapse risk is higher in submucosal and pedunculated leiomyomas [5].

Once prolapsed, they usually become necrotic and might get infected as a result of an impairment of the blood supply through the pedicle [6].

The factors affecting the inversion of the leimyoma include thinning and weakening of the uterine wall at the seating point of the tumor implantation due to pressure atrophy; the larger the mass, the greater the pressure effect and the risk of prolapse. The contractions of the uterine musculature irritated by the tumor raise the possibility of prolapse [5].

A submucosal leiomyoma usually manifests on MRI as a mass with signal intensity that is iso- to hypointense compared to the normal myometrium on T1-weighted images and hypointense on T2 and diffusion-weighted images [4].

These tumors can prolapse into the vaginal cavity and become necrotic, showing a high signal on a T2-weighted image and a relatively low signal with poor enhancement on fat-saturated and contrast-enhanced T1-weighted images with no restricted diffusion [4].

Three steps are necessary to remove a myoma: devascularization, detachment, and removal [7].

III. Uterine sarcoma :

Uterine sarcomas are rare, high-malignancy tumors that arise from smooth muscles and connective tissue elements. They account for around 1% of all malignant gynecologic tumors and 3%-7% of uterine malignancies [8].

The most common types are leiomyosarcoma, carcinosarcoma, endometrial stromal sarcoma, undifferentiated sarcoma, and adenosarcoma [9].

The most common age of occurrence is between 40 and 50 years, and rarely before 30 years [10].

Sarcomatous changes occur in 0.5% of fibroids [10].

1. Rhabdomyosarcoma

Rhabdomyosarcomas originating from the female genital tracts, including the uterus, are very rare in patients older than 40 years and are divided into three main histological variants: pleomorphic, alveolar, and embryonal types. The embryonal type is the most common and favorable type [11].

MRI is the method of choice and shows a typically well-defined mass that is inhomogeneous with intermediate signal intensity on T1-weighted images and intermediate to high on T2-weighted images, with diffusion restriction and intense contrast enhancement of solid parts (as the tumor may show necrotic areas) [12].

2. Carcinosarcoma

MRI of carcinosarcoma commonly demonstrates a large exophytic and protruding mass in the endometrial cavity. The signal intensity is typically iso-intense or slightly high on T1-weighted images and predominantly high on T2-weighted images, with restricted diffusion on DWI and strongly enhanced on DCE imaging. [4].

Tumor prolapse through the cervix into the vaginal cavity occurs in around half of individuals with carcinosarcomas and in a few cases with adenosarcomas [9].

3. Adenosarcoma

Adenosarcomas, also called Müller adenosarcomas, are uncommon, accounting for 8% of all uterine sarcomas [9]. They mostly affect post-menopausal women in their late 50s and early 60s, while few cases have been documented in women between the ages of 19 and 40 [13].

It has been observed that long-term oestrogen therapy, pelvic radiotherapy, and particularly tamoxifen medication increases the incidence of adenosarcoma [9].

Adenosarcoma demonstrates a well-defined polypoid mass that arises from the endometrium and protrudes to the uterine cavity. It frequently exhibits bleeding, necrosis, or cystic parts (reflecting cystic dilation of the endometrial glands) [4].

MRI demonstrates a polypoid mass with a stalk that extends to the uterine cavity. The signal of the tumor on a T2-weighted image is homogeneously hyperintense compared to the myometrium, containing cystic dilation of the endometrial glands [4].

4. Treatment of uterine sarcomas

The treatment of uterine sarcoma is total abdominal hysterectomy (TAH) en bloc and bilateral salpingo-oophorectomy. When a patient has early-stage sarcoma or is of reproductive age, the preservation of her ovaries may be considered. When uterine sarcoma is discovered following a hysterectomy, particularly if the uterus is fragmented by morcellation or if the cervix or ovaries remain in place, further surgery should be considered following a pathologic review and imaging assessment to identify any extrauterine extension of the disease [9].

For inoperable patients, pelvic radiotherapy with or without brachytherapy and/or chemotherapy and hormonal therapy can be considered [9].

The overall survival after lymphadenectomy (LAD) is not statistically significant because the lymph node metastases in patients with uterine sarcomas were not sufficiently prevalent to justify systematic lymphadenectomy, however selective LAD can be considered when patients have obvious extrauterine involvement and clinically suspicious enlarged nodes [14].

IV. Endometrial carcinoma

Endometrial carcinoma is the most prevalent gynecologic cancer and the fourth most common cancer in women and accounts for approximately 80% of endometrial carcinomas; other histologic types include adenocarcinoma with squamous differentiation, adenosquamous carcinoma, clear cell carcinoma, and papillary serous carcinoma [15].

Though any woman of childbearing age may be affected, postmenopausal women make up about 80% of all patients [4].

Endometrial carcinoma usually appears on MRI as a mass with a signal that is hypo- to isointense compared to normal endometrium on T1-weighted images and iso- to hyperintense in T2-weighted images [4].

After Gadolinium administration, endometrial carcinoma enhances earlier than normal endometrium but later than the adjacent myometrium, allowing identification of small tumors, even those contained by the endometrium [16].

It can be distinguished from common submucosal leiomyoma due to its high signal on diffusion-weighted images [4].

Due to the high potential for metastasis related to uterine serous carcinoma, surgical treatment must be customized based on the patient's health status as well as the stage, histological subtype, tumor size, location, and severity of symptoms [17].

The most common treatment is surgery, including total hysterectomy, bilateral salpingo-oophorectomy, bilateral pelvic lymphadenectomy, systematic para-aortic lymphadenectomy, complete omentectomy, and peritoneal cytology, followed by chemotherapy and radiotherapy [17].

Conclusion

Prolapsed uterine tumors can mimic cervical cancer clinically, but the detection of a stalk connecting the prolapsed tumor to the uterine cavity at CT or MR imaging (the Broccoli sign) is an important imaging clue to the correct diagnosis [1]. Both benign and malignant masses of the uterine body can show the « Broccoli sign » [4].

Imaging plays a crucial role in preoperative localization and narrows the differential diagnosis. MRI, particularly DWI and DCE, are the key sequences to differentiating between malignant and benign tumors, showing in case of malignancy restricted diffusion with enhancement on DCE imaging.

Patient consent

Informed written consent was obtained from all 4 patients for publication of the case report and all imaging studies.

REFERENCES

[1] Jhaa P, Changa S, Rabbanb JT, Chenc L, Yeha BM, Coakleya FV. Utility of the broccoli sign in the distinction of prolapsed uterine tumor from cervical tumor. Eur J Radiol 2012;81:1931–6.

[2] Patel N, Hatfield J, Sohaey R, Fergus V. Coakley MRI of prolapsed polypoid adenomyoma: expanding the differential diagnosis for the broccoli sign. Clin Imaging 2018;52:177–9.

[3] Kim JW, Lee CH, Kim KA, Park CM. Submucosal leiomyoma: usefulness of broccoli sign on CT and MR imaging. Clin Imaging 2008;32(3):233–5.

[4] E Kozawa, M Takahashi, S Meguro, M Yasuda, N Iwasa, K Fujiwara, F Kimura Benign and malignant tumor of the uterine body with broccoli sign: MR imaging features for differential diagnosis Japan Radiological Society 2013

[5] DACT Chandrasiri, BM Munasinghe, EJ Pushpakanthan, JBU Jayasinghe and RD Nissankaarachchi Vaginal prolapse of a large uterine cervical leiomyoma complicated with cervical inversion: a case report of an extremely rare entity with review of the literature SAGE Open Medical Case Reports Volume 10: 1–6 © The Author(s) 2022

[6] Kim JW, Lee* CH, Kim KA, Park CM. Spontaneous prolapse of pedunculated uterine submucosal leiomyoma: usefulness of broccoli sign on CT and MR imaging. Clin Imaging 2008;32:233–5.

[7] Golan, A., Zachalka, N., Lurie, S., Sagiv, R., & Glezerman, M. (2005). Vaginal removal of prolapsed pedunculated submucous myoma: a short, simple, and definitive procedure with minimal morbidity. Arch Gynecol Obstet 2005;271(1):11–13.

[8] Seagle B-LL, Sobecki-Rausch J, Strohl AE, Shilpi A, Grace A, Shahabi S. Prognosis and treatment of uterine leiomyosarcoma: a National Cancer Database study. Gynecol Oncol 2017;145(1):61–70.

[9] D Bužinskienė,S Mikėnas,G Drąsutienė, M Mongirdas Uterine sarcoma: a clinical case and a literature review Acta Medica Lituanica. 2018. Vol. 25. No. 4. P. 206–218 © Lietuvos mokslų akademija, 2019

[10] Kanukolanu RN, Gopalan* U, Kumarapillai SK, Kanukolanu RN PP, et al. A rare diagnosis with a common presentation: a case report on uterine sarcoma. Int J Reprod Contracept Obstet Gynecol 2021;10(6):2498–500.

[11] Yamada1 S, Harada Y, Noguchi H, Satoh N, Kimura S, Nakayama T, Tanimoto A. Embryonal rhabdomyosarcoma arising from the uterine corpus in a postmenopausal female: a surgical case challenging the genuine diagnosis on a cytology specimen. Diagn Pathol 2016;11:3.

[12] P Sobieraj, Z Malas, T Issat, A Raciborska, MB Figatowska Rhabdomyosarcoma of the genitourinary system in girls — the role of magnetic resonance imaging in diagnosis, treatment monitoring, and follow-up ORIGINAL PAPER /GYNECOLOGY, 10.5603/gpl.95047

[13] Zaloudek CJ, Hendrickson RH, Soslow RA. Mesenchymal tumor of the uterus. Blaustein's pathology of the female genital tract. Kurman RJ, Ellenson LH, Ronnett BM, editors editors. New York: Springer; 2011.

[14] Si M, Jia L, Song K, Zhang Q, Kong B. Role of lymphadenectomy for uterine sarcoma a meta-analysis. Int J Gynecol Cancer 2017;27:109Y116.

[15] Reichert RA. Pathology of the uterine corpus. Diagnostic gynecologic and obstetric pathology. Philadelphia: Lippincott Williams & Wilkins; 2012.

[16] Sala E, Wakely S, Senior E, Lomas D. MRI of malignant neoplasms of the uterine corpus and cervix. AJR Am J Roentgenol 2007;188(6):1577–87. doi:10.2214/AJR.06.1196.

[17] Zhang Li, Kwan SY. Pathogenesis and clinical management of uterine serous carcinoma. Cancers 2020;12:686. doi:10.3390/cancers12030686.