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Mehmet Hakan Yetimalar[1], Derya Kilic[2], Seyran Yigit[3]

Uterine sarcomas: 7-year experience from a tertiary center

Mięsaki macicy: 7-letnie doświadczenie ośrodka o trzecim stopniu referencyjności

[1] Department of Obstetrics and Gynecology, Izmir Gozde Hospital, Izmir, Turkey
[2] Department of Obstetrics and Gynecology, Pamukkale University, Denizli, Turkey
[3] Department of Pathology, Izmir Katip Celebi University Ataturk Research and Trainig Hospital, Izmir, Turkey
Correspondence: Dr. Derya Kilic, Department of Obstetrics and Gynecology, Pamukkale University Medical School, Kinikli, Denizli, Turkey, tel.: +90 506 8654499, e-mail: deryakilic.md@gmail.com

Abstract

Uterine sarcomas are rare and aggressive gynecologic malignancies. Due to their rarity, histopathologic heterogeneity and molecular diversity, the optimal approach is still a matter of debate. Debulking surgery is still the mainstay of the treatment. But adjuvant treatment strategies remain controversial. In this study, we aimed to examine the clinical characteristics, histopathological features, tumoral behavior and recurrence patterns of patients diagnosed with uterine sarcoma at a tertiary referring center over a 7-year period. A total of 427 patients who were treated for uterine cancer between 2007 and 2014 were analyzed retrospectively. There were in total 20 patients diagnosed with uterine sarcoma. Median age of all patients diagnosed as uterine sarcomas was 50.5 years [interquartile range 11.5 (43.5–55)]. The median tumor size in these patients was 5.75 cm [interquartile range 4.38 (4.12–8.50)]. There were 5 patients with leiomyosarcomas, 10 patients with endometrial stromal sarcomas, 4 patients with undifferentiated uterine sarcomas and 1 patient with adenosarcoma. Despite our limited data, we presented our retrospective series over a period of 7 years. Prospective data and further insights are needed to better understand the tumor biology and improve treatment modalities.

Keywords: uterine sarcoma, leiomyosarcoma, carcinosarcoma, endometrial stromal sarcoma

Streszczenie

Mięsaki macicy to rzadkie i agresywne nowotwory kobiecego narządu rozrodczego. Z uwagi na rzadkość występowania, różnorodność histopatologiczną i zróżnicowanie molekularne tych nowotworów optymalny sposób leczenia pozostaje przedmiotem dyskusji. Podstawą leczenia w dalszym ciągu jest zabieg cytoredukcji, natomiast metody leczenia uzupełniającego nadal budzą kontrowersje. Celem pracy było dokonanie oceny cech klinicznych i histopatologicznych oraz zachowania się nowotworów i schematów ich nawracania u pacjentek leczonych w ośrodku o trzecim stopniu referencyjności w okresie obejmującym 7 lat. Analizą retrospektywną objęto łącznie 427 pacjentek leczonych z powodu raka macicy w latach 2007–2014. U 20 pacjentek rozpoznano mięsaka macicy. Mediana wieku wszystkich pacjentek z rozpoznaniem mięsaka macicy wynosiła 50,5 roku [przedział międzykwartylowy 11,5 (43,5–55)]. Mediana wielkości guza u tych pacjentek wynosiła 5,75 cm [przedział międzykwartylowy 4,38 (4,12–8,50)]. W badanej grupie opisano 5 przypadków mięsaka gładkokomórkowego, 10 mięsaka podścieliskowego, 4 niezróżnicowanego mięsaka macicy oraz 1 przypadek gruczolakomięsaka. Pomimo dysponowania ograniczonymi danymi autorzy przedstawili retrospektywny przegląd przypadków obejmujący okres 7 lat. W celu lepszego zrozumienia biologii nowotworów oraz poprawy skuteczności metod leczenia niezbędne są dane z badań prospektywnych i dalsze analizy.

Słowa kluczowe: mięsak macicy, mięsak gładkokomórkowy, mięsakorak, mięsak podścieliskowy

INTRODUCTION

Uterine sarcomas are rare gynecologic malignancies with a poor prognosis. They account for approximately 1% of gynecologic malignancies and 3–7% of uterine malignancies with an estimated 5-year survival rate of 40% for all stages[1,2]. Because of their rarity, it is hard to perform large prospective studies and there is scarce data that defines the risk factors, clinicopathological characteristics, prognostic factors, recurrence patterns and treatment options of uterine sarcomas.

Many systems have been proposed for the classification of these tumors[3,4]. The College of American Pathologists classifies uterine sarcomas mainly as leiomyosarcomas (LMS), endometrial stromal sarcomas (ESS), undifferentiated uterine sarcomas (USS) and adenosarcomas (AS)[4]. Historically, due to the biphasic morphology with a carcinoma and a sarcoma component, uterine carcinosarcomas were classified under the uterine sarcomas. From this perspective, they were termed as mixed mesodermal sarcomas. However, they are now classified as high-grade endometrial cancers. Supporting this, there is a current consensus of Cancer Genome Atlas Research Network regarding monoclonal evolution of carcinosarcomas originally from the epithelium via epithelial mesenchymal transition[5].

Due to the histopathologic heterogeneity and molecular diversity of sarcomas, the optimal treatment approach is still a matter of debate. Biological and molecular differences between the subsets of uterine sarcomas are evident and this may appear to affect their behavior. Debulking surgery is still the mainstay of treatment, but adjuvant treatment strategies remain controversial. The main problem is that a vast majority of these tumors relapse, even at early stages[6,7]. Chemotherapy and radiotherapy are not the standard of care for all these subsets in the adjuvant setting, particularly at early stages as the improvement of survival has not been well established[8,9]. Some features of these tumors are assumed as prognostic factors including mitotic count, grade, necrosis and stage, but there is no generalized prognostic algorithm for uterine sarcomas[10].

In this study, we aimed to assess clinical characteristics, histopathological features, tumoral behavior, recurrence patterns and survival outcomes of patients at a tertiary referring center during a 7-year period between 2007 and 2014 in order to contribute to the existing data.

MATERIALS AND METHODS

A retrospective study was designed and performed after Institutional Ethical Board clearance was obtained. The cohort was limited to patients who had histological diagnosis of sarcomas of the uterus. All patients were treated in a tertiary gynecologic oncology center between 2007 and 2014. Demographic data, age, systemic diseases, laboratory test results (tumor markers), tumor characteristics, surgical information, postoperative treatment data, recurrence pattern and survival outcomes were obtained from the hospital medical record system.

Age was grouped as <50 and ≥50 years. All patients underwent surgery with or without adjuvant treatment. Surgical procedures were classified into four categories as simple hysterectomy and bilateral salpingo-oophorectomy (TAH + BSO), TAH + BSO and pelvic lymphadenectomy, TAH + BSO and pelvic + para-aortic lymphadenectomy and debulking surgery with extensive metastasectomy. Standardized lymphadenectomy was performed according to the GOG surgical procedure recommendations in all patients who underwent surgical staging[11]. Patients without surgical treatment due to medical comorbidities and those who required neoadjuvant chemotherapy were excluded from the study.

Chemotherapy regimes were grouped as paclitaxel, carboplatin + paclitaxel, pegylated liposomal doxorubicin and other. Radiotherapy options were grouped as external beam radiotherapy (EBRT), vaginal brachytherapy (VBRT) and combination of these two.

All pathological specimens were evaluated at the same center. For tumor characteristics; subtype, mitotic count, necrosis, atypia, grade, stage, tumor size, lymph node metastasis, and stage were collected. Tumor size was classified into three groups: <5, 5–9.9 and 10 cm. Mitosis count was evaluated according to criteria of French Federation of Cancer Centres (FNCLCC) grading of soft tissue sarcomas[12].

Tumor stage was retrospectively determined on the basis of surgical and pathological findings using the 2009 International Federation of Gynecology and Obstetrics (FIGO) staging system for uterine cancers[11]. Adequate lymphadenectomy was defined as the GOG surgical procedure recommendations appropriate in the analyzed time period[13].

The recurrence pattern and the site of the recurrence were also analyzed.

The time during and after primary treatment with no clinical or imaging signs of relapse or progression was defined as progression-free survival (PFS) and the time from the date of diagnosis to the date of the last follow-up was defined as overall survival (OS). The data on the follow-up period was also collected and analyzed.

Statistical analyses

Statistical analyses were performed using the SPSS software package, version 21 (Computing Resource Centre, Santa Monica, California, USA). Descriptive statistics were used to report patient demographics. Demographic and clinical data were presented with contingency tables.

RESULTS

A total of 427 patients who were treated for uterine cancer between 2007 and 2014 were analyzed retrospectively. According to the inclusion criteria defined in Materials and Methods section, 20 patients diagnosed with uterine sarcoma were eligible for our analyses.

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	LMS (*n* = 5)	ESS (*n* = 10)	USS (*n* = 4)	AS (*n* = 1)
Age [years]:				
• median	51.0	44.0	67.5	55
• <50	2 (40%)	7 (70%)	0 (0%)	0 (0%)
• ≥50	3 (60%)	3 (30%)	4 (100%)	1 (100%)
Menopausal status:				
• premenopausal	2 (40%)	6 (60%)	0 (0%)	0 (0%)
• postmenopausal	3 (60%)	4 (40%)	4 (100%)	1 (100%)
AS – adenosarcoma; **ESS** – endometrial stromal sarcoma; **LMS** – leiomyosarcoma; **USS** – undifferentiated stromal sarcoma.				

Tab. 1. The clinical presentation of uterine sarcoma groups

According to the histological subgroup evaluation, there were 5 patients diagnosed as leiomyosarcoma, 10 patients diagnosed as endometrial stromal sarcoma, and 5 patients in the other subgroup (1 patient with AS and 4 patients with undifferentiated uterine sarcoma). Diabetes and/or hypertension/metabolic syndrome were diagnosed in 4 patients. Among uterine sarcomas, 16 patients were assigned to stage 1, none of the cases to stage 2, 1 case to stage 3 and 3 cases to stage 4, according to the FIGO 2009 criteria.

Overall, the median age and tumor size of the patients is the uterine sarcoma group was 50.5 years [interquartile range 11.5 (43.5–55)] and 5.75 cm [interquartile range 4.38 (4.12–8.50)], respectively. All patients in the USS subgroup were postmenopausal. However, most of the cases in the ESS subgroup were premenopausal. The clinical characteristics of the sarcoma group are summarized in Tab. 1.

All patients in the uterine sarcoma group underwent surgery. Surgical findings, histopathological features and management data of the cases were evaluated separately and are presented individually in Tabs. 2–4.

Leiomyosarcomas

Five patients with LMS were managed. The treatment modalities and recurrence pattern of patients with LMS are represented in Tab. 2.

The median tumor diameter of leiomyosarcomas was 5.50 cm [interquartile range 2.75 (5.00–7.75)]. The maximum tumor size was 9.5 cm and the minimum tumor size was 5 cm. Two out of 5 patients underwent lymphadenectomy. Para-aortic lymphadenectomy was performed in 1 of these 2 patients. None of the patients had lymph node metastases and none of the patients presented with an extrauterine disease. The details of adjuvant treatment modalities and recurrence patterns are shown in Tab. 2.

One out of 5 patients had no recurrence during her follow-up period of 32 months. All other patients had recurrences, which were treated by surgery alone, surgery with chemotherapy and radiotherapy, chemotherapy alone and radiotherapy alone.

Endometrial stromal sarcomas

Ten patients with ESS were managed. Among these patients, 1 patient was diagnosed with high grade ESS and 9 patients were diagnosed with low grade ESS. The treatment modalities and recurrence pattern of the patients with ESS were summarized in Tab. 3.

The median tumor diameter was 4.25 cm [interquartile range 4.50 (3.00–7.50)]. Tumor size were analyzed in three groups: <5, 5–9.9 and 10 cm (Tab. 2). The maximum tumor size was 10 cm and the minimum tumor size was 1 cm. The median number of removed pelvic/para-aortic lymph nodes in 5 patients was 49 [interquartile ranged 11 (44–55)]. The details of adjuvant treatment modalities and recurrence patterns are shown in Tab. 3.

Among 10 patients, 3 patients were lost to follow-up. For the other patients, the mean follow-up period was 25.14 ± 16.42 months. One had experienced recurrence at 24 months of her follow-up, which was treated by surgery with chemoradiotherapy. All the other patients had no recurrences during their follow-up period.

Undifferentiated uterine sarcomas and adenosarcomas

Four patients with USS and 1 patient with AS were managed. The treatment modalities and recurrence patterns for the group are presented in Tab. 4.

The median tumor diameter in patients with USS was 7.00 cm [interquartile range 8.25 (6.25–14.5)]. The maximum tumor size was 17 cm and the minimum tumor size was 6 cm. The median number of removed pelvic lymph nodes was 23.50 [interquartile range 43 (8.75–51.75)] in 5 patients. Among these patients, pelvic/para-aortic

No.	Age	Tumor size	Mitosis count	Stage	Surgery	Adj. CT	Adj. RT	Recc.	Recc. site	DFS
1	48	5 cm	2	1A	TAH + BSO	+	VBRT	+	Inguinal LAP	40
2	54	6 cm	3	1B	TAH + BSO + pelvic/para-aortic LND	-	VBRT	+	Lung	26
3	53	5.5 cm	3	1A	TAH + BSO + pelvic LND	-	-	+	Vagina	12
4	46	9.5 cm	3	1B	TAH + BSO	-	VBRT + EBRT	-	-	-
5	51	5 cm	3	1B	TAH + BSO	+	-	+	Lung	26

Adj. CT – adjuvant chemotherapy; **Adj. RT** – adjuvant radiotherapy; **DFS** – disease-free survival; **EBRT** – external beam radiotherapy; **LAP** – lymphadenopathy; **Recc.** – recurrence; **Recc. site** – recurrence site; **TAH + BSO** – simple hysterectomy and bilateral salpingo-oophorectomy; **TAH + BSO + pelvic LND** – TAH + BSO and pelvic lymphadenectomy; **TAH + BSO + pelvic/para-aortic LND** – TAH + BSO and pelvic + para-aortic lymphadenectomy; **VBRT** – vaginal brachytherapy.

Tab. 2. Treatment modalities and recurrence patterns in patients with leiomyosarcoma

No.	Age	Tumor size	Grade	Stage	Surgery	Adj. CT	Adj. RT	Recc.	Recc. site	DFS	Follow-up time [months]
1	45	1 cm	Low-grade	1A	TAH + BSO						Lost to follow-up
2	61	5 cm	Low-grade	1A	TAH + BSO + pelvic/para-aortic LND	-	-	-			13
3	50	7 cm	3	1A	TAH + BSO + pelvic/para-aortic LND	-	-	-			48
4	52	4 cm	3	1B	TAH + BSO + pelvic/para-aortic LND	-	VBRT + EBRT	+	Abd.	24	29
5	45	4.5 cm	Low-grade	1A	TAH + BSO + pelvic/para-aortic LND	-	-	-		-	12
6	43	3 cm	Low-grade	1B	TAH + BSO		VBRT + EBRT		-		47
7	39	3 cm	Low-grade	1A	TAH + BSO	-	-	-			Lost to follow-up
8	33	10 cm	Low-grade	1A	TAH + BSO	-	VBRT + EBRT	-			11
9	42	9 cm	Low-grade	3B	Debulking	+ (Caelyx)	-	-			16
10	38	4 cm	Low-grade	3B	Debulking						Lost to follow-up

Abd. – abdominal; **Adj. CT** – adjuvant chemotherapy; **Adj. RT** – adjuvant radiotherapy; **DFS** – disease-free survival; **EBRT** – external beam radiotherapy; **Recc.** – recurrence; **Recc. site** – recurrence site; **TAH + BSO** – simple hysterectomy and bilateral salpingo-oophorectomy; **TAH + BSO + pelvic/para-aortic LND** – TAH + BSO and pelvic + para-aortic lymphadenectomy; **VBRT** – vaginal brachytherapy.

Tab. 3. Treatment modalities and recurrence patterns in patients with endometrial stromal sarcoma

metastasis was observed in 1 patient (20%) after total pelvic/para-aortic lymph node dissection. There was no lymph node metastasis in the patient with AS. Extrauterine tumor was observed in 2 (40%) patients. The details of adjuvant treatment modalities and recurrence pattern are shown in Tab. 4. Among 5 patients, 1 patient was lost to follow-up. All of the other patients had no recurrences during their follow-up period.

DISCUSSION

This was a retrospective study conducted in order to contribute to the existing data as these tumors are rare and obscure, although limited by a small sample size. Even early stage diseases tend to relapse and have a propensity to the distant metastasis[6,14,15]. Unfortunately, there is no effective preoperative diagnostic test for uterine sarcomas[15,16]. In addition, no pathognomonic features have been defined for imaging modalities[17].

There is a lack of evidence on prognostic factors and ideal treatment modalities. Surgery remains the mainstay of the treatment of uterine sarcomas, but there is a lack of data about optimal adjuvant interventions. Apart from the high grade endometrial cancers, total pelvic and/or paraaortic lymphadenectomy is not a part of surgical treatment in early stage disease unless suspicious lymphadenopathy exists[18]. It was documented in larger series that LMS is the most common type of uterine sarcomas. Patients with ESS tend to be younger than other groups, which is in concordance with the findings in our study.

Nusrath et al. presented 11 cases of uterine sarcomas treated in their tertiary care center during an 8-year period.

No.	Age	Tumor size	Hystologic type	Stage	Surgery	Adj. CT	Adj. RT	Recc.	Recc. site	Follow-up period [month]
1	75	7 cm	USS	1B	TAH + BSO + pelvic LND	-	-	-	-	18
2	77	6 cm	USS	1B	TAH + BSO + pelvic LND	-	VBRT + EBRT	-	-	24
3	55	7 cm	USS	3C	TAH + BSO + pelvic/para-aortic LND	+ (carbo-taxan)	VBRT + EBRT	-	-	10
4	60	17 cm	USS	4B	Debulking					Lost to follow-up
5	55	11 cm	AS	1B	TAH + BSO + pelvic LND	-	-	-	-	4

Adj. CT – adjuvant chemotherapy; **Adj. RT** – adjuvant radiotherapy; **AS** – adenosarcoma; **DFS** – disease-free survival; **EBRT** – external beam radiotherapy; **Recc.** – recurrence; **Recc. site** – recurrence site; **TAH + BSO** – simple hysterectomy and bilateral salpingo-oophorectomy; **TAH + BSO + pelvic LND** – TAH + BSO and pelvic lymphadenectomy; **TAH + BSO + pelvic/para-aortic LND** – TAH + BSO and pelvic + para-aortic lymphadenectomy; **USS** – undifferentiated stromal sarcoma; **VBRT** – vaginal brachytherapy.

Tab. 4. The treatment modality and recurrence pattern of patients with undifferentiated uterine sarcoma and adenosarcoma

Clinical presentation, histopathological and recurrence patterns were investigated in their article. Among their patients; 4 were ESS, 6 were LMS and 1 was AS. The median age of patients was 53 and 49 years in the ESS and LMS group, respectively. Similar to our study, all patients with LMS were stage 1 in their report. The majority of their study group had a recurrence in a very short time, almost a 1-year period. Although it is not statistically significant, they reported that patients with tumor less than 5 cm (stage 1A) had a better survival than those with tumor size of more than 5 cm (stage 1B), and the survival of patients who received adjuvant therapy did not differ significantly. Two patients with ESS were stage 1, and 2 patients with ESS were stage 4 and the patient with AS was stage 1 in their study group. Apart from our study there was no patient with USS[19].

Kyriazoglou et al. retrospectively analyzed patients treated for uterine sarcomas in their institution over a period of 17 years. In their data, there were 51 patients with LMS, 3 with high-grade ESS, and 5 with USS. In their study group, increased mitotic index was the only recognized independent significant prognostic factor in the multivariate analysis. Their study group was heterogeneous and no significant impact of adjuvant therapy could be drawn as a result, which is in line with other studies[20]. Further insights are needed for the adjuvant treatment of uterine sarcomas. There is also a lack of data for the ideal treatment modalities. European Organisation for Research and Treatment of Cancer (EORTC 55874) randomized control trial for early stage sarcoma, which aimed to compare radiation versus no further treatment, was remarkable at this point. In this study, no difference was found either in local control or survival outcomes[21]. A French sarcoma group evaluated the impact of additional adjuvant chemotherapy to radiotherapy (RT) or RT alone. The study was conducted in patients with completely surgically resected carcinosarcomas and uterine sarcomas and found moderate improvement in PFS rates, but no improvement in OS rates[22]. According to the guideline of the German Society for Gynecology and Obstetrics (Deutsche Gesellschaft für Gynäkologie und Geburtshilfe e. V., DGGG) and the Austrian Society of Gynecology and Obstetrics (Österreichische Gesellschaft für Gynäkologie und Geburtshilfe, OEGGG), RT should not be performed after complete resection of a stage I/II LMS[15].

The body of evidence concerning adjuvant computed tomography (CT) is also controversial. The result of a recent meta-analysis seeking for the effect of adjuvant CT in early stage LMS conducted on national cancer database was coherent with no survival improvement in comparison to observation/failed to prolong survival[23]. And even in advanced stages after cytoreductive surgery it is still a matter of debate whether treatment contributes to any improvement in survival or not[24,25]. National Comprehensive Cancer Network (NCCN) and ESMO guidelines recommend adjuvant CT for high risk patients with uterine sarcoma[6]. Hormonal therapy have been suggested to be efficacious in the treatment of ESS, but there is a lack of data regarding the optimal usage[26]. According to the guideline of DGGG and OEGGG, adjuvant CT should not be generally administered and it should depend on the presence of other risk factors[15].

It is also remarkable that the molecular patterns of these tumors are totally different[26,27]. In a large retrospective series including 419 patients with uterine sarcomas, the stage of disease was reported as the most important prognostic factor for all tumor types. The authors emphasized that there are determinant differences in survival between uterine sarcoma subtypes. Leiomyosarcomas and ESS can be divided into different groups[14]. Characterization of a molecular prognostic panel might be especially useful for guiding therapeutic interventions for these patients.

CONCLUSION

Uterine sarcomas are group of gynecologic malignancies which shows histopathologic and molecular diversity. This marked heterogeneity within uterine sarcoma subtypes warrants an individualized treatment approach. Most of the patients are diagnosed in early stages and surgery is in the cornerstone of the therapy. Optimal adjuvant therapy on the other hand is yet to be defined. Along with the accumulated data on management, centralization of treatment is crucial for an improvement in prognosis

Conflict of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

1. Hosh M, Antar S, Nazzal A et al.: Uterine sarcoma: analysis of 13,089 cases based on surveillance, epidemiology, and end results database. Int J Gynecol Cancer 2016; 26: 1098–1104.
2. Noone AM, Howlader N, Krapcho M et al. (eds.): SEER Cancer Statistics Review, 1975–2015. National Cancer Institute, Bethesda, MD. Available from: https://seer.cancer.gov/csr/1975_2015/ [based on November 2017 SEER data submission, posted to the SEER web site, April 2018].
3. Lu Z, Chen J: [Introduction of WHO classification of tumours of female reproductive organs, fourth edition]. Zhonghua Bing Li Xue Za Zhi 2014; 43: 649–650.
4. Otis C, Ocampo A: Protocol for the Examination of Specimens from Patients with Sarcoma of the Uterus. College of American Pathologists, 2013. Available from: http://www.cap.org/apps/docs/committees/cancer/cancer_protocols/2013/UterineSarcomaProtocol_3000.pdf [cited: 29 April 2014].
5. Cherniack AD, Shen H, Walter V et al.; Cancer Genome Atlas Research Network: Integrated molecular characterization of uterine carcinosarcoma. Cancer Cell 2017; 31: 411–423.
6. ESMO/European Sarcoma Network Working Group: Soft tissue and visceral sarcomas: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. Ann Oncol 2014; 25 Suppl 3: iii102–iii112.
7. Mancari R, Signorelli M, Gadducci A et al.: Adjuvant chemotherapy in stage I–II uterine leiomyosarcoma: a multicentric retrospective study of 140 patients. Gynecol Oncol 2014; 133: 531–536.

8. Gronchi A, Stacchiotti S, Verderio P et al.: Short, full-dose adjuvant chemotherapy (CT) in high-risk adult soft tissue sarcomas (STS): long-term follow-up of a randomized clinical trial from the Italian sarcoma group and the Spanish sarcoma group. Ann Oncol 2016; 27: 2283–2288.

9. Roque DR, Taylor KN, Palisoul M et al.: Gemcitabine and docetaxel compared with observation, radiation, or other chemotherapy regimens as adjuvant treatment for stage I-to-IV uterine leiomyosarcoma. Int J Gynecol Cancer 2016; 26: 505–511.

10. Hanley KZ, Birdsong GG, Mosunjac MB: Recent developments in surgical pathology of the uterine corpus. Arch Pathol Lab Med 2017; 141: 528–541.

11. Kim HS, Song YS: International Federation of Gynecology and Obstetrics (FIGO) staging system revised: what should be considered critically for gynecologic cancer? J Gynecol Oncol 2009; 20: 135–136.

12. French Federation of Cancer Centers Sarcoma Group – Tumor Differentiation Score by Histologic Type. In: Fletcher CDM, Bridge JA, Hogendoorn PCW et al. (eds.): WHO Classification of Tumours of Soft Tissue and Bone. 4th ed., IARC Press, Lyon 2013; Coindre JM: Grading of soft tissue sarcomas: review and update. Arch Pathol Lab Med 2006; 130: 1448–1453; Hasegawa T: Histological grading and MIB-1 labeling index of soft-tissue sarcomas. Pathol Int 2007; 57: 121–125; Coindre JM, Trojani M, Contesso G et al.: Reproducibility of a histopathologic grading system for adult soft tissue sarcoma. Cancer 1986; 58: 306–309.

13. Whitney CW, Spirtos N: Gynecologic Oncology Group Surgical Procedures manual. Gynecologic Oncology Group, Philadelphia 2010.

14. Abeler VM, Røyne O, Thoresen S et al.: Uterine sarcomas in Norway. A histopathological and prognostic survey of a total population from 1970 to 2000 including 419 patients. Histopathology 2009; 54: 355–364.

15. Denschlag D, Ackermann S, Battista MJ et al.: Sarcoma of the Uterus. Guideline of the DGGG and OEGGG (S2k Level, AWMF Register Number 015/074, February 2019). Geburtshilfe Frauenheilkd 2019; 79: 1043–1060.

16. Amant F, Coosemans A, Debiec-Rychter M et al.: Clinical management of uterine sarcomas. Lancet Oncol 2009; 10: 1188–1198.

17. Thomassin-Naggara I, Dechoux S, Bonneau C et al.: How to differentiate benign from malignant myometrial tumours using MR imaging. Eur Radiol 2013; 23: 2306–2314.

18. SGO Clinical Practice Endometrial Cancer Working Group; Burke WM, Orr J, Leitao M et al.: Endometrial cancer: a review and current management strategies: part I. Gynecol Oncol 2014; 134: 385–392.

19. Nusrath S, Bafna S, Rajagopalan R et al.: Uterine sarcomas: experience from a tertiary cancer care center from India. Indian J Surg Oncol 2019; 10: 342–349.

20. Kyriazoglou A, Liontos M, Ziogas DC et al.: Management of uterine sarcomas and prognostic indicators: real world data from a single-institution. BMC Cancer 2018; 18: 1247.

21. Reed NS, Mangioni C, Malmström H et al.; European Organisation for Research and Treatment of Cancer Gynaecological Cancer Group: Phase III randomised study to evaluate the role of adjuvant pelvic radiotherapy in the treatment of uterine sarcomas stages I and II: an European Organisation for Research and Treatment of Cancer Gynaecological Cancer Group Study (protocol 55874). Eur J Cancer 2008; 44: 808–818.

22. Pautier P, Floquet A, Gladieff L et al.: A randomized clinical trial of adjuvant chemotherapy with doxorubicin, ifosfamide, and cisplatin followed by radiotherapy versus radiotherapy alone in patients with localized uterine sarcomas (SARCGYN study). A study of the French Sarcoma Group. Ann Oncol 2013; 24: 1099–1104.

23. Littell RD, Tucker LY, Raine-Bennett T et al.: Adjuvant gemcitabine-docetaxel chemotherapy for stage I uterine leiomyosarcoma: trends and survival outcomes. Gynecol Oncol 2017; 147: 11–17.

24. Bogani G, Fucà G, Maltese G et al.: Efficacy of adjuvant chemotherapy in early stage uterine leiomyosarcoma: a systematic review and meta-analysis. Gynecol Oncol 2016; 143: 443–447.

25. Hensley ML, Ishill N, Soslow R et al.: Adjuvant gemcitabine plus docetaxel for completely resected stages I–IV high grade uterine leiomyosarcoma: results of a prospective study. Gynecol Oncol 2009; 112: 563–567.

26. Serkies K, Abacjew-Chmyłko A, Wieczorek-Rutkowska M et al.: Aromatase inhibitor therapy for endometrial stromal sarcoma – two-centre experience. Ginekol Pol 2018; 89: 607–610.

27. Bacalbasa N, Balescu I, Dima S et al.: Prognostic factors and survival in patients treated surgically for primary and recurrent uterine leiomyosarcoma: a single center experience. Anticancer Res 2015; 35: 2229–2234.

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