



# Classification and Clinical Staging of Endometriosis

# 8

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## 8.1 Introduction

It was K. Rokitansky in 1860 [1] who was one of the first to describe endometriosis in detail. A large number of further publications showed how complex endometriosis is and that it is a disease with a wide variety of forms and localizations of manifestation. Many attempts have been made to describe the anatomical extent of the disease and also to classify it. The secondary adhesions caused by endometriosis have also been considered to some extent. The attempt was made to take into account the different regions or organs affected to be able to make a statement about the severity of the disease using a score. Until a few years ago, the disease was mainly assessed by surgical intervention. Primarily, the classification focused on the changes of the internal genital organs and peritoneum, but none of the systems includes a comprehensive representation of both peritoneal, ovarian, and deep endometriosis and adhesions in one system. Currently, the most commonly used AFS/rASRM classification is also used primarily with regard to fertility [2, 3].

Due to the inadequacy of the existing systems, especially because of the enormously improved surgical therapy and the much more differentiated diagnostics, attempts have been made in the past to redefine the assessment, description, and classification of endometriosis. Based on recommendations, several attempts were made to evaluate the advantages and disadvantages of the classifications most commonly used at present, so that they can be applied in the combined form if necessary [4–6].

Taking into account the existing literature and evidence, these are the revised American Society for Reproductive Medicine (rASRM) classification, the Enzian classification, and the Endometriosis Fertility Index (EFI) [7]. The consensus clearly showed the various advantages and disadvantages of the systems mentioned. A classification should allow an accurate comparison of the results of reproductive, medical, and surgical interventions.

It also became obvious that a correct morphological-anatomical description of endometriosis is an indispensable prerequisite for the comparison of different entities of the disease and therapeutic outcomes.

The analyses available to date show that the rASRM classification, with a relatively imprecise grading of findings into four stages, does not comprehensibly represent the complexity of the disease [7]. Thus, the validity of many studies is limited.

The need for an alternative or additional classification system, particularly regarding DE, is a matter of constant debate [8–21].

An ideal classification system should provide not only information about the general severity of the disease, but also a detailed description of the extent of the various lesions.

In addition, noninvasive, i.e., sonographic and MR tomographic, as well as invasive methods should be included in the description/classification.

Of course, it would be very helpful with these classifications to be able to predict correlations between the extent/localization of pathological findings and prognosis, symptoms, difficulties in surgery, and thus risk of complications.

The diagnosis and treatment of endometriosis are now increasingly performed by multidisciplinary teams like radiologists, sonographers, and various surgical specialties involving gynecological, colorectal, and urological surgeons. It is this multimodality approach that now requires the most uniform language possible in the use of classification systems for peritoneal and ovarian endometriosis including adhesions and/or deep endometriosis (DE) and adenomyosis. Currently, the rASRM, EFI, and ENZIAN classifications are used differently in a mixed or modular way to meet the needs of the sonographer and the radiologist of the specialist in reproductive medicine and the gynecological surgeon.

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## 8.2 The rASRM Score

The American Fertility Society (AFS) first published the score in 1979 [3] with further revisions in 1985 (rAFS score) and 1996, and it is now used in revised form as the American Society for Reproductive Medicine (rASRM) score [3]. The extent of endometriosis is assessed primarily by diagnostic laparoscopy to evaluate, in particular, the lesions on the peritoneum, tube, ovary, and sacrouterina ligaments and Douglas(POD). Using a numerical scoring system for points corresponding to the size of the endometriotic lesion as well as the grade of the foci, a classification of four severity grades, namely minimal, mild, moderate, and severe endometriosis (Figs. 8.1 and 8.2) is made.

In rASRM classification, endometriosis is mainly classified by invasive procedures [3, 4].

It has been used worldwide for over 40 years for clinical and scientific publications to describe and compare clinical findings [5].

The application of the system is very sophisticated to then ultimately reduce the stages to only four categories. The classification primarily considers endometriosis at the peritoneum and ovary and adhesions but ignores DE and adenomyosis. Extragenital structures such as the bowel, bladder, rectovaginal septum (RVS), or ureter are not considered by the rASRM score. In a study by Wustlich and al., based on 63 patients with DE including recto-sigmoid endometriosis, 21% were found to have only stage 1 or 2 according to the r-ASRM scoring system [22].

During the last decade, important developments in the field of noninvasive diagnostics open new aspects in terms of accurate classification.

Few studies attempted to evaluate the applicability of transvaginal ultrasound (TVS) or magnetic resonance imaging (MRI) for noninvasive use of rASRM classification. Leonardi et al. [6, 23] Williams et al. [24] investigated the diagnostic accuracy of TVS for predicting surgically verified stages of rASRM endometriosis. Holland et al. [25] found good agreement between TVS findings and the surgical rASRM stage. Large prospective studies on the accuracy of TVS- or MRI-based endometriosis classification using the noninvasive rASRM score are lacking.

The severity of various pain symptoms caused by endometriosis with different stages of disease categorized by the rASRM score has been studied by



**AMERICAN SOCIETY FOR REPRODUCTIVE MEDICINE  
REVISED CLASSIFICATION OF ENDOMETRIOSIS**

Patient's Name \_\_\_\_\_ Date \_\_\_\_\_

Stage I (Minimal) - 1.5      Laparoscopy \_\_\_\_\_ Laparotomy \_\_\_\_\_ Photography \_\_\_\_\_

Stage II (Mild) - 6.15      Recommended Treatment \_\_\_\_\_

Stage III (Moderate) - 16.40

Stage IV (Severe) - > 40

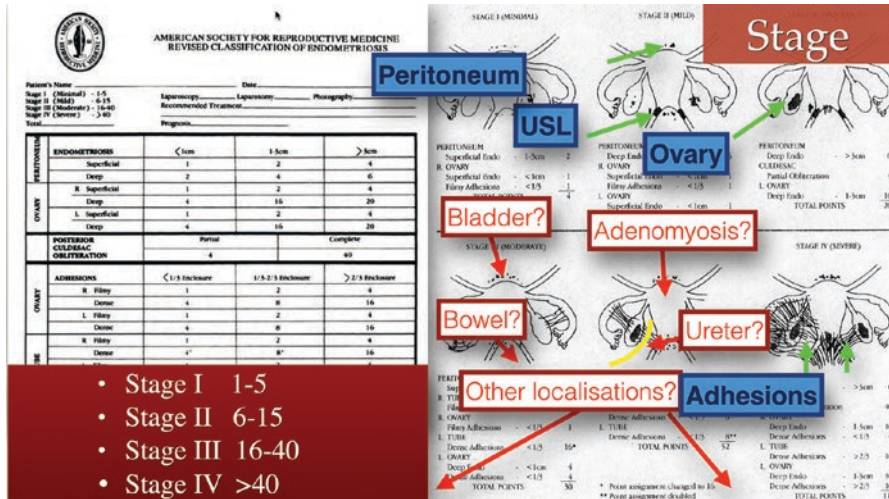
Total \_\_\_\_\_ Prognosis \_\_\_\_\_

PERITONEUM	ENDOMETRIOSIS	< 1cm	1-3cm	> 3cm
		Superficial	1	2
	Deep	2	4	6
OVARY	R Superficial	1	2	4
	Deep	4	16	20
	L Superficial	1	2	4
	Deep	4	16	20
	POSTERIOR CULDESAC OBLITERATION	Partial		Complete
		4		40
OVARY	ADHESIONS	< 1/3 Enclosure	1/3-2/3 Enclosure	> 2/3 Enclosure
	R Filmy	1	2	4
	Dense	4	8	16
	L Filmy	1	2	4
	Dense	4	8	16
TUBE	R Filmy	1	2	4
	Dense	4	8	16
	L Filmy	1	2	4
	Dense	4	8	16

\* If the fimbriated end of the fallopian tube is completely enclosed, change the point assignment to 16.  
Denote appearance of superficial implant types as red [(R), red, red-pink, flamelike, vesicular blobs, clear vesicles]. white [(W), opacifications, peritoneal defects, yellow-brown], or black [(B) black, hemosiderin deposits, blue]. Denote percent of total described as R \_\_%, W \_\_%, and B \_\_%. Total should equal 100%.

**Fig. 8.1** rASRM classification of endometriosis. The evaluation is performed through surgery. The stages result from the addition of points determined in particular according to the findings at the adnexa and cul-de-sac

Vercellini et al. [26] and Fedele et al. [27]. The association between rASRM stages and the degree and type of pelvic symptoms was inconsistent [28]. Little correlation between the r-ASRM stage and pain symptoms may be explained by the unclear pathophysiological behavior of the disease itself, but possibly also by the lack of a correct classification of the complex deep infiltrating disease. Chapron et al. [29] showed a correlation between the severity of dysmenorrhea and the presence of posterior deep infiltrating endometriosis (DE). There was no correlation between rASRM stages and pain symptoms in women with DE, and no correlations between the rASRM stage and postoperative natural pregnancy rates [10, 30].



**Fig. 8.2** rASRM classification. Classification into four stages by a very complex scoring system including adhesions. Mainly intraperitoneal foci are considered; the deep infiltrating foci and extragenital localizations are only minimally taken into account, if at all

Similar inconsistent results are found in the correlation of the rASRM stage and the incidence of operative difficulties and complications.

Poupon, using a nomogram, could not observe a clear correlation between rASRM stages and the occurrence of various complications [31, 32].

A problem that should not be underestimated also lies in the methodology and practical implementation of an accurate classification.

The very complex system of ASRM classification with its various exceptions is extremely error-prone and thus unreliable if not used digitally. Metzemaker [33] compared rASRM, Enzian, and EFI in paper and digital applications (EQUUSUM). Not all exception rules are applied by expert endometriosis surgeons, leading to incorrect scoring.

The EQUUSUM, a worldwide web-based dynamic registration and classification/scoring system for (deep) endometriosis, improves correct classification/scoring of the currently recommended rASRM, Enzian, and EFI score and is more user-friendly compared to nondigital classification.

### 8.3 The EFI (Endometriosis Fertility Index)

The Endometriosis Fertility Index (EFI) (Fig. 8.3) published in 2010 by Adamson et al. [17] is used to predict fertility outcomes in relation to natural conception probabilities after surgical intervention.

### ENDOMETRIOSIS FERTILITY INDEX (EFI) SURGERY FORM

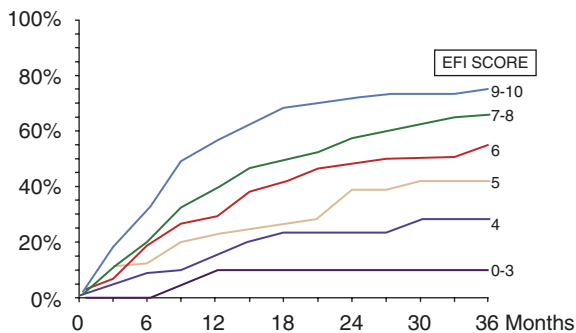
#### LEAST FUNCTION (LF) SCORE AT CONCLUSION OF SURGERY

Score	Description	Left	Right
4	= Normal	Fallopian Tube <input style="width: 40px; height: 20px;" type="text"/>	<input style="width: 40px; height: 20px;" type="text"/>
3	= Mild Dysfunction	Fimbria <input style="width: 40px; height: 20px;" type="text"/>	<input style="width: 40px; height: 20px;" type="text"/>
2	= Moderate Dysfunction	Ovary <input style="width: 40px; height: 20px;" type="text"/>	<input style="width: 40px; height: 20px;" type="text"/>
1	= Severe Dysfunction		
0	= Absent or Nonfunctional		
To calculate the LF score, add together the lowest score for the left side and the lowest score for the right side. If an ovary is absent on one side, the LF score is obtained by doubling the lowest score on the side with the ovary.		Lowest Score <input style="width: 40px; height: 20px;" type="text"/>	+ <input style="width: 40px; height: 20px;" type="text"/>
		Left	Right
		= <input style="width: 40px; height: 20px; border: 1px dashed black;" type="text"/> LF Score	

### ENDOMETRIOSIS FERTILITY INDEX (EFI)

Historical Factors			Surgical Factors		
Factor	Description	Points	Factor	Description	Points
Age	If age is ≤ 35 years	2	LF Score	If LF Score = 7 to 8 (high score)	3
	If age is 36 to 39 years	1		If LF Score = 4 to 6 (moderate score)	2
	If age is ≥ 40 years	0		If LF Score = 1 to 3 (low score)	0
Years Infertile	If years infertile is ≤ 3	2	<b>AFS Endometriosis Score</b>		
	If years infertile is > 3	0	If AFS Endometriosis Lesion Score is < 16	1	
Prior Pregnancy	If there is a history of a prior pregnancy	1	If AFS Endometriosis Lesion Score is ≥ 16	0	
	If there is no history of prior pregnancy	0	<b>AFS Total Score</b>		
<b>Total Historical Factors</b>			<b>Total Surgical Factors</b>		
EFI = TOTAL HISTORICAL FACTORS + TOTAL SURGICAL FACTORS :			<input style="width: 40px; height: 20px;" type="text"/>	+	<input style="width: 40px; height: 20px;" type="text"/>
			Historical		Surgical
					= <input style="width: 40px; height: 20px;" type="text"/> EFI Score

### ESTIMATED PERCENT PREGNANT BY EFI SCORE



**Fig. 8.3** EFI endometriosis fertility index

The EFI, a mathematical model, is based on a 10-point scoring system that includes factors such as patient age, duration of infertility and previous pregnancy, rASRM classification, and postoperative adnexal status. This is defined by a visual assessment of tubo-ovarian function by the least function (LF) score after surgery (including fallopian tubes, tubal fimbriae, and ovaries) (Fig. 8.3).

Its clinical applicability and value have been confirmed by several studies in which the validity of the external application of the EFI has been tested and positively confirmed [34, 35].

The use of the EFI has gained wide acceptance among reproductive surgeons and clinicians involved in MAR and is supported by the WES (World Endometriosis Society) for use in the classification of endometriosis [2] and an international consensus group on the recording of deep endometriosis surgery (CORDES) [21].

The following aspects should be considered:

1. EFI is a multifactorial calculation system.
2. Out of the 10 points to be calculated, only a maximum of 2 points are directly attributed to endometriosis.
3. The pathological change in the condition of the fallopian tube may also not be endometriosis-related.
4. EFI does not consider DE, extrapelvic endometriosis, or adenomyosis.

EFI is a useful model for calculating the probability of pregnancy in endometriosis or after surgical treatment of endometriosis. It cannot be described as a classification for endometriosis.

To date, only a single study has evaluated whether EFI can be used via noninvasive methods [36]. Future studies will be required, possibly also using other classifications.

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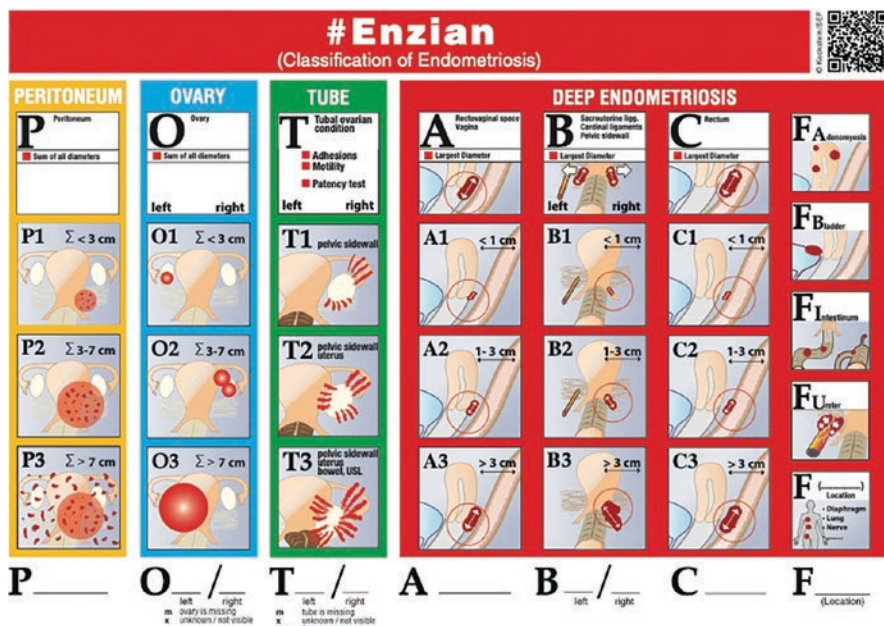
## 8.4 The Enzian Classification

Due to the problem of incomplete coverage of endometriosis using rASRM classification (deep infiltrating disease not adequately taken into account), the Scientific Endometriosis Foundation (SEF) created the ENZIAN classification in 2003 [37–39]. It accurately describes DE and can be used in combination with the r-ASRM classification. The Enzian classification, revised in 2009, classifies the various localizations of DE (vagina, uterosacral ligaments (USL), bladder, ureter, bowel, the uterus, and other extragenital locations) and the dimension of the lesions. For the complete description, a detailed code is used [40].

The Enzian classification for deep endometriosis is part of the new #Enzian classification. In Fig. 8.4, the different anatomical compartments for deep endometriosis (DE) are illustrated in red color.

The pelvis is divided into *three* compartments:

1. Compartment **A**: rectovaginal space (RVS), the vagina, and torus uterinus (craniocaudal axis).
2. Compartment **B**: USLs, the cardinal ligaments, the parametric space, and the pelvic sidewall (mediolateral axis).
3. Compartment **C**: Bowel (rectum and sigmoid) affects up to 16 cm from the anal verge, (ventrodorsal axis).



**Fig. 8.4** #Enzian classification: an overview with potentially affected organs and compartments. The individual compartments are designate with the capital letters, and the various lesion sizes are numbered 1, 2, and 3 [51]

Severity is defined as follows (peritoneal lesions less than 5 mm depth of infiltration are excluded):

1. Grade 1: invasion <1 cm
2. Grade 2: invasion 1–3 cm
3. Grade 3: invasion >3 cm

Adenomyosis and other extragenital sites (**F**) are described as follows: Adenomyosis (**FA**); bladder DE (**FB**), extrinsic and/or intrinsic ureteric involvement with signs of obstruction (**FU**), bowel DE (**FI**) cranial to the rectosigmoid junction (>16 cm from anal verge; upper sigmoid, transverse colon, caecum, appendix, and small bowel), and other sites (**FO**) such as the abdominal wall, diaphragm, and involvement of nerves / sacral roots.

The description of the lesions was also primarily done by surgical procedures.

Several studies have now demonstrated the applicability of TVS or magnetic resonance imaging (MRI) for noninvasive use of the ENZIAN classification. Di Paola et al. [41] and Burla et al. [42] showed high rates of agreement between MRI-based and surgical findings. Thomassin-Naggara et al. [43] identified a significant correlation between the surgical findings and length of hospital stay using the



Enzian classification. Hudelist and Montanari et al. [28, 44] proved the high correlation between TVS findings and surgically determined DE localization and lesion size using the Enzian classification, especially for the compartments A, C, and FB described in the Enzian classification. In contrast to the rASRM score, the different DE localization correlated with the severity of the different preoperative pain symptoms [45, 46].

The Enzian classification allows a prediction of the complexity of surgical procedures: surgery duration and the risk of complications [31, 47]. A study by Roman and colleagues [48], evaluating three different surgical approaches for the treatment of intestinal endometriosis, proved that surgery times, as well as complication rates and improvement of symptoms, correlate with the classification according to the C compartment.

The nomogram developed by Poupon [32] allows prognostic calculation of the expected complications during surgery using the Enzian classification. No such correlation concerning complication rates was observed between rASRM stages I and II or between ASRM stages III and IV.

Imboden et al. [49] identified increased postoperative bladder dysfunction with radical surgery for extensive endometriosis in the Enzian B compartment.

The extent of symptoms was shown to indeed correlate with the extent of DE as classified by the Enzian score [46]. In an analysis based on 156 patients with DE and bowel involvement, Mutuku et al. [50] demonstrated a clear association between preoperative and intraoperative findings evaluated with the Enzian scoring system with a significant correlation between the extent of DE and the presence of dyspareunia. Montanari and coworkers [45] found also that disease extent depicted by the Enzian classification is associated and correlated with the presence and severity of different preoperative pain symptoms.

### 8.4.1 The #Enzian Classification

The Enzian classification has been objected to for various reasons and criticisms, mainly in Europe. One criticism was the necessity to use different systems at the same time, which complicates the documentation process itself.

To overcome this, the Enzian classification has recently been further developed into a comprehensive classification system, the #Enzian Classification, in the context of a consensus process of a group of experts in 2019 and 2020 [51].

The #Enzian classification is based on the known Enzian classification [40] for DE using three compartments (**A**, **B**, and **C**) as well the bladder (**FB**) the ureters (**FU**), other intestinal locations (sigmoid colon, small bowel, etc. **FI**), and other extragenital lesions (**FO**). To have comprehensive coverage of endometriosis, the involvement of the peritoneum (**P**), ovary (**O**), and adhesions is now also classified (**T**), including the tubal patency.

## 8.4.2 Coding of the #Enzian Classification

#Enzian **P**\_, **O**\_/\_, **T**\_/\_, **A**\_, **B**\_/\_, **C**\_, **F**\_ (…), …

- *Individual compartments* or organ involvement are identified with capital letters (**P**, **O**, **T**, **A**, **B**, **C**, **F**).
- The *extent of endometriosis* is represented by the numbers 1, 2, and 3 in compartment **P**, **O**, **T**, **A**, **B**, and **C**.
- *Paired organs* (ovary, tube, uterosacral ligament (USL), parametrium, and ureter). The severity is arranged separately after the letter (left / right).
- *Missing / invisible ovary or tube* is described with suffix (**m** – missing; **x**, unknown).
- *Tubal patency* (optionally) can be annotated with “+” (patent) or “-” not patent.

### Example:

#Enzian summarized in the code:

• Superficial endometriosis on the peritoneum 4 cm ( <b>P</b> )	= <b>P2</b>
• Ovarian endometriosis, right 4 cm ( <b>O</b> )	= <b>O0/2</b>
• No adhesions on the tubo-ovarian unit ( <b>T</b> ) Adhesions left ovary/pelvic side wall; both tubes patent	= <b>T1+/0+</b>
• No lesion in the A compartment	= <b>A0</b>
• Deep endometriosis left USL 2 cm, right USL 3 cm ( <b>B</b> )	= <b>B2/2</b>
• Deep endometriosis in the rectum 2 cm ( <b>C</b> )	= <b>C2</b>
• Hydroureter right ( <b>FU</b> )	= <b>FU(r)</b>
• Endometriosis in the appendix ( <b>FI</b> )	= <b>FI (App.)</b>

Only affected compartments and organs should be listed:

#Enzian **P2**, **O0/2**, **T1+/0+**, **B2/2**, **C2**, **FU(r)**, **FI (Appendix)**

The unique novelty of the #Enzian classification lies in the possibility of both surgical and noninvasive staging, combined with high accuracy, and serves as a common unifying language for all clinical specialties, including sonographers, radiologists, and surgeons [40, 51]. Typical sonographic features of the different phenotypes of DE, described by the IDEA [52] (International Deep Endometriosis Analysis group), are taken into account and incorporated into the #ENZIAN system.

It should be used independently of the imaging modality (TVS, MRI) and type of surgery. A prefix can be used optionally in brackets following the word #Enzian (i.e., #Enzian(s) P1, ... ) to depict the modality of evaluation of the disease when using the #Enzian:

- #Enzian(**u**) assessment by ultrasound
- #Enzian(**m**) assessment by MRI
- #Enzian(**s**) assessment by surgery

For the sonographic description, the proposal of IDEA [35] (International Deep Endometriosis Analysis Group) is taken into account and included in the #ENZIAN system. It describes the findings (localization and size) very accurately.

DiGiovanni et al. [53] recently demonstrated in a retrospective analysis of 93 women undergoing TVS and surgery for DE that preoperative evaluation of localization and size of DE lesions in different #Enzian compartments by an expert gynecological sonography is very accurate, with high sensitivity and specificity. It is the first study showing that the #Enzian classification can be applied to describe disease extent both at TVS and surgery, offering an accurate descriptive system for both noninvasive and invasive specialties. This has been confirmed by the prospective Study on 745 Patients of Montanari et al. [54].

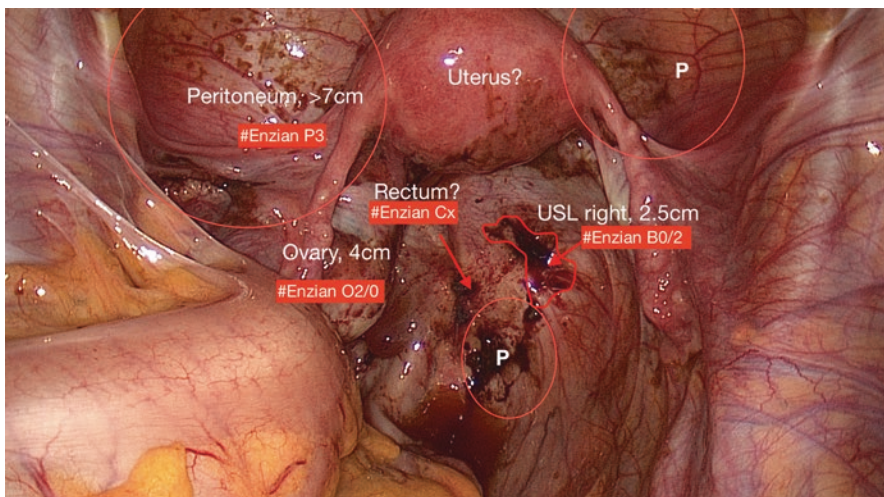
Example:

• Superficial endometriosis on the peritoneum >7 cm (P)	= P3
• Ovarian endometriosis, left 4 cm, right normal (O)	= O2/0
• No adhesions on the tubo-ovarian unit (T) both tubes patent	= T0+/0+
• Deep endometriosis, left USL normal, right USL 2.5 cm (B)	= B0/2
• Rectum, extent not clearly visible (C)	= Cx

• #Enzian(s) P3, O2/0, T0+/0+,B0/2, Cx,

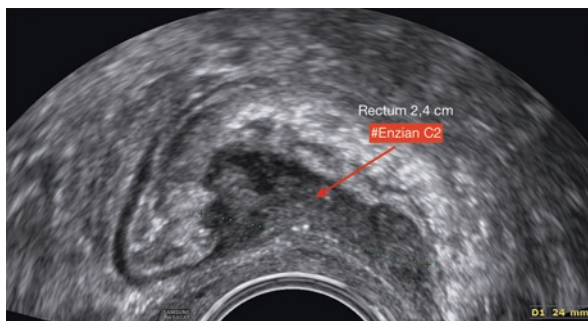
• Rectum, length of the nodule 2.4 cm(C)	= C2
• Uterus (adenomyosis)	= FA

Final coding with #Enzian classification, merging both, the laparoscopic and ultrasound findings (Figs. 8.5, 8.6, and 8.7):



**Fig. 8.5** Example of surgical classification of endometriosis; visible lesions on the peritoneum, left ovary, right USL, and rectum (#Enzian (s))

**Fig. 8.6** TVS imaging of the rectal endometriosis of the same patient as in Fig. 8.5. (besides adenomyosis, ovarian and USL involvement)



**Fig. 8.7** TVS imaging of adenomyosis of the same patient as in Fig. 8.5 (besides rectal, ovarian, and USL involvement)



- #Enzian(s,u) P3, O2/0, T0+/0+, B0/2, C2(u), FA(u)

## 8.5 Conclusion

The treatment of endometriosis has completely changed in the last years due to enormous progress in surgical therapy, but especially due to the improvement of noninvasive diagnostics. Classification of the disease has been used primarily for the postoperative staging of the disease. Unfortunately, the most commonly used rASRM classification does not correlate with symptoms, or other important parameters, and cannot be used for noninvasive diagnostics. Moreover, it does not take into account deep infiltrating endometriosis and extra pelvic endometriosis.

The EFI is better than the rASRM classification for calculating the probability of pregnancy.

It does not contain differential information on the location and extent of lesions, especially DE.

The ENZIAN classification is predominantly used to describe DE. The applicability of the Enzian classification with MRI and TVS is possible and allows to assess the difficulty of the surgical procedure and the risk of complications in surgical

procedures. Whether the ENZIAN can be used to predict fertility outcomes remains to be determined.

The recently released updated version, called the #ENZIAN classification, represents a comprehensive description of peritoneal and ovarian endometriosis as well as adnexal adhesions in addition to deep endometriosis. #Enzian system is anatomically logical, easy to use, and reproducible providing clinicians with a reproducible image of the disease. The correlation between preoperative and surgical staging, namely classification of the extent of disease obtained based on the #Enzian scheme allows for consistent and clear classification of endometriosis, especially DE but also secondary adhesions. Endometriosis can be mapped completely with one single classification system applicable by preinvasive and invasive methods thereby enabling the use of one common language for describing endometriosis. In the same way as patients with cancer are described using the TNM classification, the #ENZIAN classification can be used to supplement the descriptive terms of endometriosis. The exact structural allocation of the compartments and exact description of affected organ structures may enable doctors to obtain a virtual picture of the extent of endometriosis.

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