

# Surgical Treatment of Patients with Endometriosis in the Certified Endometriosis Centers of the DACH Region – A Subanalysis of the Quality Assurance Study QS ENDO pilot

## Die operative Behandlung von Patientinnen mit Endometriose in den zertifizierten Endometriosezentren der DACH-Region – eine Subanalyse der Studie zur Qualitätssicherung QS ENDO pilot



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quality of care, reality of care, care research, endometriosis centers, quality indicators, surgery

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## ABSTRACT

**Introduction** After puberty, at least 10% of all women and girls suffer from endometriosis. Surgery is useful for both the diagnosis and therapy. To date, quality indicators for the surgical treatment of endometriosis are lacking. QS ENDO aims to record the quality of care provided in the DACH region and to introduce quality indicators for the diagnosis and treatment of endometriosis. In the first phase of the study, QS ENDO real, the reality of care was recorded using a questionnaire. The second phase, QS ENDO pilot, investigated the treatment of patients who underwent surgery in certified endometriosis centers in a defined time-period.

**Material and Methods** The surgical data of 10 patients from each of the 44 endometriosis centers in the DACH region was recorded using an online tool. Collected data included the approach used, the endometriosis phenotype, a description of the surgical site, resection status, histological confirmation, the use of a classification, and any complications. All operations were carried out in October 2016 as the defined time-period. The surgical approaches used were compared with the recommendations in the current guidelines.

**Results** The data of 435 patients with a median age of 34 years were evaluated. 315 (72.4%) were nulliparous. 120 patients had given birth to at least one child and 42.5% (51) of them had delivered their child by caesarean section. About 50% of all patients also had deep infiltrating endometriosis in addition to ovarian endometriosis, and the median NAS score was 7.5. With regards to the surgical treatment, endometriomas were completely resected in 81% (94) of patients. 87.3% of patients underwent resection of peritoneal endometriosis. Forty-one patients had a hysterectomy, with a total hysterectomy carried out in 26 (63.4%) and a supracervical hysterectomy in 15 (36.6%) patients. Of the 59 patients with bowel endometriosis, half had segmental resection and half had shaving of the anterior rectal wall. Complications requiring revision occurred in 0.9% of cases.

**Conclusion** The surgical procedures carried out in the certified endometriosis centers of the DACH region are largely in line with the recommendations for appropriate surgical approaches in the current standard guidelines.

## ZUSAMMENFASSUNG

**Einleitung** Mindestens 10% aller Frauen und Mädchen während der Geschlechtsreife leiden an Endometriose. Eine Operation ermöglicht Diagnostik und Therapie gleichermaßen. Bisher fehlen Qualitätsindikatoren für die operative Behandlung. QS ENDO soll die Versorgungsqualität in der DACH-Region erfassen und Qualitätsindikatoren für die Diagnostik und Therapie der Endometriose einführen. In der 1. Stufe QS ENDO real wurde anhand eines Fragebogens die Versorgungsrealität erfasst. In der 2. Phase QS ENDO pilot wurde die Behandlung von Patientinnen, die innerhalb eines definierten Zeitraums an den zertifizierten Endometriosezentren operiert wurden, untersucht.

**Material und Methoden** Aus 44 Endometriosezentren wurden anhand eines Online-Tools für je 10 Patientinnen Daten zur Operation erfasst. Hierzu gehörten der Zugangsweg, der Phänotyp der Endometriose, die Beschreibung des OP-Situs, der Resektionsstatus, eine histologische Sicherung, die Anwendung einer Klassifikation und etwaige Komplikationen. Alle Operationen waren im Oktober 2016 als definiertem Zeitraum erfolgt. Die operativen Vorgehensweisen wurden mit den aktuellen Leitlinienempfehlungen verglichen.

**Ergebnisse** Die Daten von 435 Patientinnen mit einem medianen Alter von 34 Jahren wurden ausgewertet. 315 (72,4%) waren Nulliparae. 120 Patientinnen hatten mindestens 1 Kind geboren, davon 42,5% (51) per Kaiserschnitt. Circa 50% aller Patientinnen wiesen neben einer ovariellen auch eine tief-infiltrierende Endometriose auf und hatte einen medianen NAS-Score von 7,5. Für die operative Therapie zeigt sich, dass Endometriome in 81% (94) komplett entfernt wurden. Peritoneale Endometriose wurde in 87,3% reseziert. Von 41 hysterektomierten Patientinnen wurde bei 26 (63,4%) eine totale und bei 15 (36,6%) eine suprazervikale Hysterektomie durchgeführt. Von 59 Patientinnen mit Darmendometriose wurde jeweils zur Hälfte eine Segmentresektion und ein Shaving der Rektumvorderwand durchgeführt. Revisionsbedürftige Komplikationen kamen in 0,9% vor.

**Schlussfolgerung** Die Operationen an den zertifizierten Endometriosezentren der DACH-Region stehen in Bezug auf die operativen Techniken größtenteils mit den derzeit gängigen Leitlinien im Einklang.

## Introduction

The quality assurance program QS ENDO was initiated to determine the actual quality of care provided to patients with endometriosis in the DACH region (Germany, Austria, Switzerland) [1]. In the first phase of the study, QS ENDO real, the reality of care provided to patients with endometriosis in the DACH region was recorded using a questionnaire [2]. In the second phase of the study, QS ENDO pilot, the quality of care was investigated using data from 435 patients who underwent surgery in certified endometriosis centers (level II and III, n = 44) [3]. The QS ENDO study aims to determine the quality of care in all centers and all institutions in the DACH region; in the 4th phase (QS ENDO follow-up),

data obtained from the follow-up of patients will be used to generate a long-term prognosis including pregnancy rates.

Endometriosis is one of the most common gynecological disorders and has a high morbidity [4]. Endometriosis is defined by groups of endometrium-like cells are present outside the uterine cavity. Reliable data on the prevalence of endometriosis are lacking. It is assumed that the disease occurs in up to 10–15% of women of child-bearing age [5, 6].

Even though a new non-invasive diagnostic method has been developed to detect microRNA-based endometriosis in saliva samples [7], laparoscopic surgery with tissue sampling and histopathological confirmation of the diagnosis is still the gold standard to diagnose endometriosis [8, 9]. A recent multicenter study

found that the use of blood-based biomarkers to detect endometriosis did not provide conclusive results [10]. The use of surgery to diagnose endometriosis offers the opportunity to resect endometriosis lesions during the same procedure. The current ESHRE recommendation on diagnostic tests indicates that, in future, a diagnosis could also be made using non-surgical means (e.g., liquid biopsy or imaging) [7, 11].

Surgery to treat endometriosis is an essential part of the overall management of the disease.

Depending on the localization of the endometriosis lesions, the recommendations issued by professional medical societies regarding the appropriate surgical approach differ or are lacking. As weighing up the treatment goal (which is usually freedom from pain) against the wish to maintain functionality and fertility is difficult, every decision must only be taken after the benefits and the downsides have been weighed up on a case-by-case basis.

Both the European ESHRE guideline and the German-language AWMF guideline on endometriosis [8, 11] include firm recommendations about surgical approaches. Both guidelines consider the use of ablation and excision to treat peritoneal endometriosis equivalent value with regards to reducing pain; however, excision is preferred because it is more effective in patients with dysmenorrhea. Reducing the risk of recurrence is also important as is the excision of atypical endometriosis assessed as a precancerous lesion [8, 11].

For ovarian endometriosis, complete removal with cyst enucleation to prevent recurrence is recommended in the primary setting as this allows for better analgesia and increases the chances of spontaneous conception for women who wish to have children. There are no recommendations for recurrent ovarian endometriosis, as the surgery-related reduction of the oocyte reserve must be considered. Ovarian cystectomy does not need to be carried out if assisted reproductive technology (ART) is planned. The ESHRE guideline does not provide much guidance on endometriosis of the vagina and rectovaginal septum, whereas the AWMF guideline proposes carrying out functionally adapted complete resection if the patient is symptomatic. Both guidelines attach great importance to a multidisciplinary or interdisciplinary setting in appropriately qualified centers for the surgical treatment of bowel endometriosis. Although the AWMF guideline explicitly does not commit to a single surgical method, the European guideline recommends segmental resection if the sigmoid colon shows signs of endometriosis. Ureterolysis is the treatment of choice for ureteral endometriosis, while resection of detected lesions, usually by partial cystectomy, is recommended for endometriosis of the bladder. In addition to total hysterectomy, the AWMF guideline also includes an alternative approach (in this case, supracervical hysterectomy) to treat isolated adenomyosis of the uterus without deep infiltrating endometriosis. In contrast, the ESHRE guideline has committed to total hysterectomy as its preferred method to treat isolated adenomyosis [8, 11].

To date, there has been no multicenter study either in German-speaking countries or internationally which has investigated the primary surgical approach used for different situations. Even though the surgical approach must be decided on a case-by-case basis, it is essential that standards are defined in future as this will allow the quality of outcomes to be compared. QS ENDO pilot was

the first step in this direction as the study carried out a survey of the standard approaches used in the certified centers of the DACH region.

In the context of QS ENDO pilot, we were able to show that even in specialized centers, a lack of information was reported as the reason for incomplete resection in almost one fifth of cases [3]. In every discussion with the patient, the potential scenarios discussed with the patient play a decisive role. To what extent deep infiltrating endometriosis is also present in patients with suspected peritoneal or ovarian endometriosis cannot be predicted with the highest level of certainty, even with preoperative imaging or MRI [12].

To be able to consider these questions in more depth, it is worth taking a closer look at the data collected as part of the QS ENDO pilot study [3].

After the publication of data on patients' medical history and the diagnostic workup, the focus is now on surgical parameters, which are the key components determining the quality of all types of treatment.

## Material and Methods

At the Weißensee conferences in 2015, 2016 and 2017, the QS ENDO Working Group, which includes 18 experts from the scientific advisory board of the German Endometriosis Research Foundation (SEF), developed criteria which were reviewed with regards to their suitability as quality parameters. The aim was to collect data about these parameters for the QS ENDO pilot study using an online documentation system. The collected data also included the parameters for surgery.

The methodology and study design have been already published elsewhere [3].

### Patient cohort and period of observation

In October 2017, all certified endometriosis centers in Germany, Austria and Switzerland were contacted. Participation in the study was required for every certified clinical (level II) and clinical-scientific center (level III). In today's certification procedure, these levels correspond to "endometriosis clinic" and "endometriosis center." Every center was required to retrospectively provide documented data for 10 patients who had undergone surgery the previous year. Only patients in whom endometriosis was confirmed histologically were included in the evaluation. To avoid selection bias, centers were required to document 10 chronological patients, counting backward from a cutoff date for surgery of 31 October 2016.

### Data query and online tool

Data were recorded and communicated using the established online documentation system of MMF GmbH. The recording and communication of data was done in accordance with the standard requirements for GCP-compliant data management in multinational clinical trials. Data entries were anonymized using individual logins. SSL encryption was used to prevent unauthorized access to the data during data transfer.

► **Fig. 1** shows the data query in the context of the online documentation.

**III. Surgery**

➤ Which approach was chosen for surgery?

Approach  Laparoscopy  Laparotomy  
 Conversion  Other

➤ Which diagnostic surgery was carried out?

Diagnostic surgery  Diagnostic hysteroscopy  
 Diagnostic laparoscopy  
 Other

Type of procedure  Chromopertubation  
 Histological biopsy

Histological confirmation of endometriosis  Yes  No

Was the status recorded in the surgical report?  Yes  No

Which of the following areas was described in the surgical report?  
 Diaphragmatic vault  
 Ileocecal pole  
 Lesser pelvis

➤ Which type of therapeutic surgery was carried out?

Type of surgery  Primary surgery  
 Surgery for recurrence → number of previous surgeries

➤ Was the procedure a completion surgery (after endometriosis was detected during a previous surgical procedure)?

Completion surgery  Yes  No  Unknown

➤ Was a classification system used to describe the stage of endometriosis?

Classification  Carried out  Not carried out

Standard  ENZIAN  
 rASRM  
 Other

➤ Results of the classification

ENZIAN standard (→ categorized into stages) Localization/stage A  B  C   
Stage  FA  FB  FU  FI  FO

rASRM standard  Stage

Other standard  Name of classification and stage

➤ Type of endometriosis and surgical approach

Type of endometriosis:  Peritoneal  
 Endometrioma/ovarian endometriosis  
 Deep infiltrating endometriosis (including adenomyosis of the uterus)

Approach used for peritoneal endometriosis:  Coagulation  Resection  Laser vaporization

Approach used for endometrioma surgery:  Puncture  Fenestration  Enucleation of the endometrioma  
 Ovariectomy  Adnexal resection  Coagulation/laser vaporization of the follicle

Localization of deep infiltrating endometriosis  Bladder  Uterus  Rectovaginal septum  
 Bowel  Ureter  Other

Partial bladder resection  Carried out  Not carried out

Type of uterine surgery  Wedge resection  Total hysterectomy  Supracervical hysterectomy

Type of surgery at the rectovaginal septum  Partial vaginal resection  
 Resection of endometriosis lesions on the rectovaginal septum

Type of bowel surgery  Segmental resection  Disc resection  
 Shaving  Appendectomy

Placement of a primary protective stoma?  Yes  No

Type of ureteral surgery  Ureterolysis  Partial ureteral resection  Ureteral re-implantation  
 Psoas hitch  Other

➤ At the end of surgery was the patient free of endometriosis?

Free of endometriosis?  Yes  No

➤ Does the doctor's letter/surgery report record a treatment recommendation?

Treatment recommendation?  Yes  No

➤ **Fig. 1** Representation of the data query in the online documentation system.

The following aspects of surgery were recorded during the survey for every patient:

- Surgical approach (laparoscopy, laparotomy, conversion, other)
- Type of operation (primary surgery, surgery for recurrence including the number of previous surgeries, completion surgery)
- Type of endometriosis determined intraoperatively (peritoneal/ovarian/deep infiltrating [including the location] and any combination of endometriosis types)
- Classification used (ENZIAN, rASRM, other)
- Documentation of the surgical site in the surgical report (no/yes and if yes, where: diaphragmatic vault, ileocecal pole, lesser pelvis)

- Resection status (complete/incomplete) and reasons for incomplete resection
- Type of approach used in specific settings
  - peritoneal endometriosis (coagulation, resection, laser vaporization)
  - ovarian endometriosis (puncture, fenestration, enucleation, ovariectomy, adnexal resection, coagulation/laser vaporization of the follicle)
  - partial bladder resection
  - type of uterine surgery (wedge resection, total hysterectomy, supracervical hysterectomy)
  - type of surgery carried out at the rectovaginal septum (partial resection of the vagina, excision of endometriosis lesions)
  - type of bowel surgery (segmental resection, disc resection, shaving, appendectomy)
  - primary protective stoma (yes/no)
  - type of ureteral surgery (ureterolysis, partial resection of the ureter, reimplantation of the ureter, psoas hitch, other)
  - free of endometriosis at the end of surgery
  - recommended treatment
  - bowel surgery/ureteral surgery/endometrioma (conversion rate, complications)
- Recommended postoperative treatment
- Complications (no/yes; if yes, which complications: intraoperative complications including information about the location, infection, neurological disorder, bladder voiding disorder, complication requiring revision)

In addition, the patients' basic data (year of birth, height, weight, parity, previous operations) were queried as well as additional diagnostic parameters (reason for presentation, symptoms including numerical rating scale for different types of pain, investigative steps). The evaluation was described in detail and discussed [3].

The documented data were checked for completeness and plausibility.

The data of 439 patients was collected, as one center sent data for nine instead of 10 patients. Four cases with no histological confirmation of endometriosis were excluded. Ultimately the data of 435 patients were evaluated.

## Statistical analysis

Data analysis was carried out after documentation was completed in accordance with the intention-to-treat principle. Statistical evaluation was done using SPSS 21 (IBM Corp. Released 2016). Data analysis in the explorative study was primarily descriptive.

Rank-sum tests (Wilcoxon or Mann-Whitney U-test) were carried out to check for a correlation between endometriosis stage and the location of endometriosis as well as the pain intensity, which was recorded using a numerical analog scale (NAS). Kruskal-Wallis test was used with four categorical variables. A p-value of less than 0.05 was considered significant.

## Comparison with guideline recommendations

To measure the quality of care, the current guidelines of the Association of Scientific Medical Societies in Germany (AWMF) and the European Society of Human Reproduction and Embryology (ESHRE) were scanned for statements which explicitly referred to the surgical approach. Both general statements and statements about the subitems "peritoneal endometriosis," "ovarian endometriosis," "deep infiltrating endometriosis," "endometriosis of the rectovaginal septum and the vagina," "bowel endometriosis" and "bladder endometriosis" as well as recommendations about the approach for hysterectomy procedures. In addition, the accompanying explanatory notes were reviewed to clarify possible additional specifications made for the recommendations.

## Results

### Cohort

The basic data of the patients (age, weight, height, body mass index) has already been presented in our previous publication, which looked at patients' medical history and the diagnostic workup [3]. ► **Table 1** provides more information by adding data on the age distribution according to parity and information about the pain intensity (NAS scores).

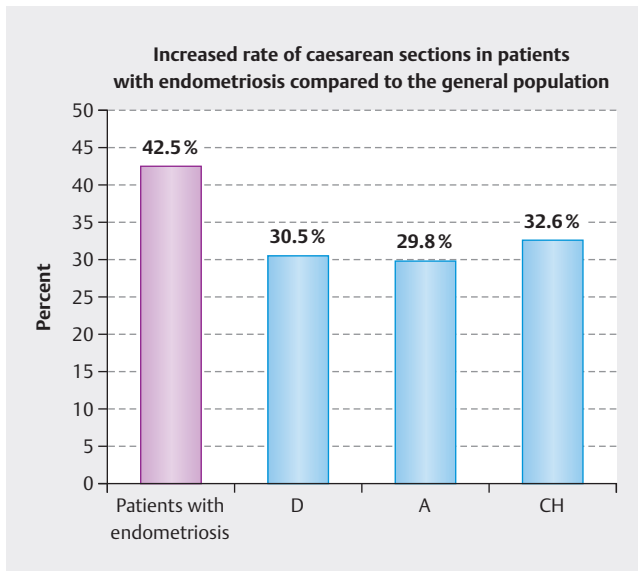
The median patient age was 34 years (mean 34.7). 315 patients (72,4%) were nulliparous and their median age was 32.6 years. For comparison, the mean maternal age at the birth of the first child in Germany in 2020 was 30.2 years (www.demografie-portal.de).

► **Table 1** Patients' basic data (age, age at parity, body mass index [BMI], reported level of pain [NAS score]).

	Mean	Median	[Min–Max]	Number (n)
Age of the total cohort (years)	34.7	34	[16–57]	435
BMI (kg/m <sup>2</sup> )	24.5	23.2	[15.6–46.4]	424*
NAS score	6.3	7	[1–10]	187
Age at parity (years)				
▪ nulliparous	32.6	32	[16–53]	315
▪ parity ≥ 1	40.3	40	[25–57]	120**

Min: minimum, Max: maximum, NAS: numerical analog scale

\* 11 patients with no information about BMI, \*\* 51 of 120 (42.5%) were delivered by caesarean section



► **Fig. 2** Caesarean section rate in percent for the cohort of patients with endometriosis (42.5%) compared to the rates for the different DACH countries (Germany, Austria, Switzerland [29.8–32.6%]). 120 patients with endometriosis had given birth, D – Germany, A – Austria, CH – Switzerland (adapted from [14, 15]).

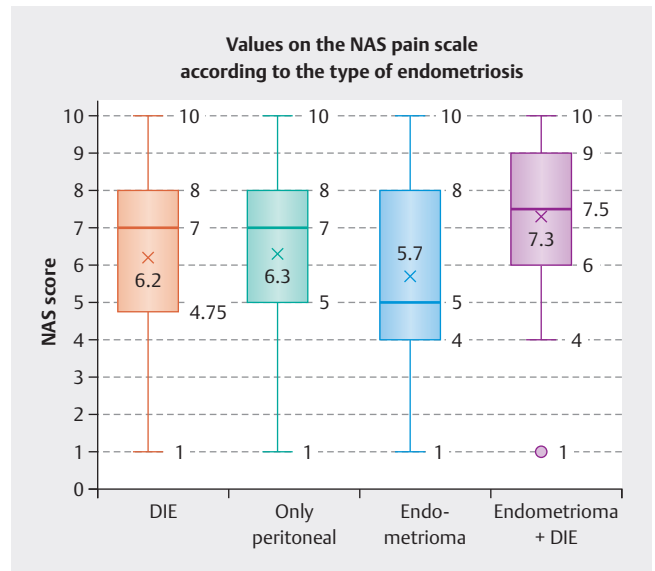
Of the 120 patients who had given birth (at least) once previously, 51 (42.5%) had delivered by caesarean section. The caesarean section rates in Germany have stabilized around 30% in recent years (2016: 30.5%, 2021: 30.9%) [13, 14]. The figures are similar for Austria (29.8% [2014]) and Switzerland (32.6% [2010]) [15]. This means that the caesarean section rate of the endometriosis patients in our analysis was more than 10% above the average (► **Fig. 2**).

### Pain intensity, type, and localization of endometriosis

Information about the pain intensity of dysmenorrhea using the numerical analog scale (NAS) and the type of endometriosis determined intraoperatively was available for 187 patients. The different types of endometriosis had similar median and mean pain intensity values. Patients without deep infiltrating endometriosis (DIE) (n = 81) reported only marginally lower mean NAS scores (6.1) compared to patients with DIE (n = 106), who had a mean NAS score of 6.6. The difference was not statistically significant (p = 0.287).

A trend to greater pain in cases with DIE and ovarian endometriosis was found when subgroups were differentiated further (► **Fig. 3**). The mean NAS score of patients who were diagnosed with DIE and endometrioma was 7.3 (SD 2.2), while patients with DIE but no endometrioma had a score of 6.2 (SD 2,7). Patients who only had peritoneal endometriosis had a NAS score of 6.3 (SD 2.7). The NAS score of 16 patients in whom endometriosis only manifested as endometriomas was 5.7 (SD 2.5).

When cases with DIE and endometriosis in segments A (rectovaginal septum and retrocervical area, vagina), B (parametrium, uterosacral ligament) or C (rectosigmoid) according to the



► **Fig. 3** Box plot showing subjective pain (mean NAS values) according to endometriosis type (solid line: median, x: average) with minimum and maximum values (including outliers for endometrioma and DIE). NAS information was available for 187 patients; 1 = little pain, 10 = strongest pain. NAS = numerical analog scale, DIE = deep infiltrating endometriosis.

#ENZIAN classification were compared with cases who only had adenomyosis, the NAS score for patients who only had adenomyosis was 5.2 (median 6) and therefore somewhat lower than the scores of patients with endometriosis in segments A, B, or C (6.8, median 8) or A, B, C and concurrent adenomyosis (7.1, median 7). The differences were not significant (p = 0.286).

### Distribution of different, simultaneously affected compartments and surgical approach

The evaluation of isolated compartments and simultaneously affected compartments led to a number of findings about the locations of endometriosis in our cohort.

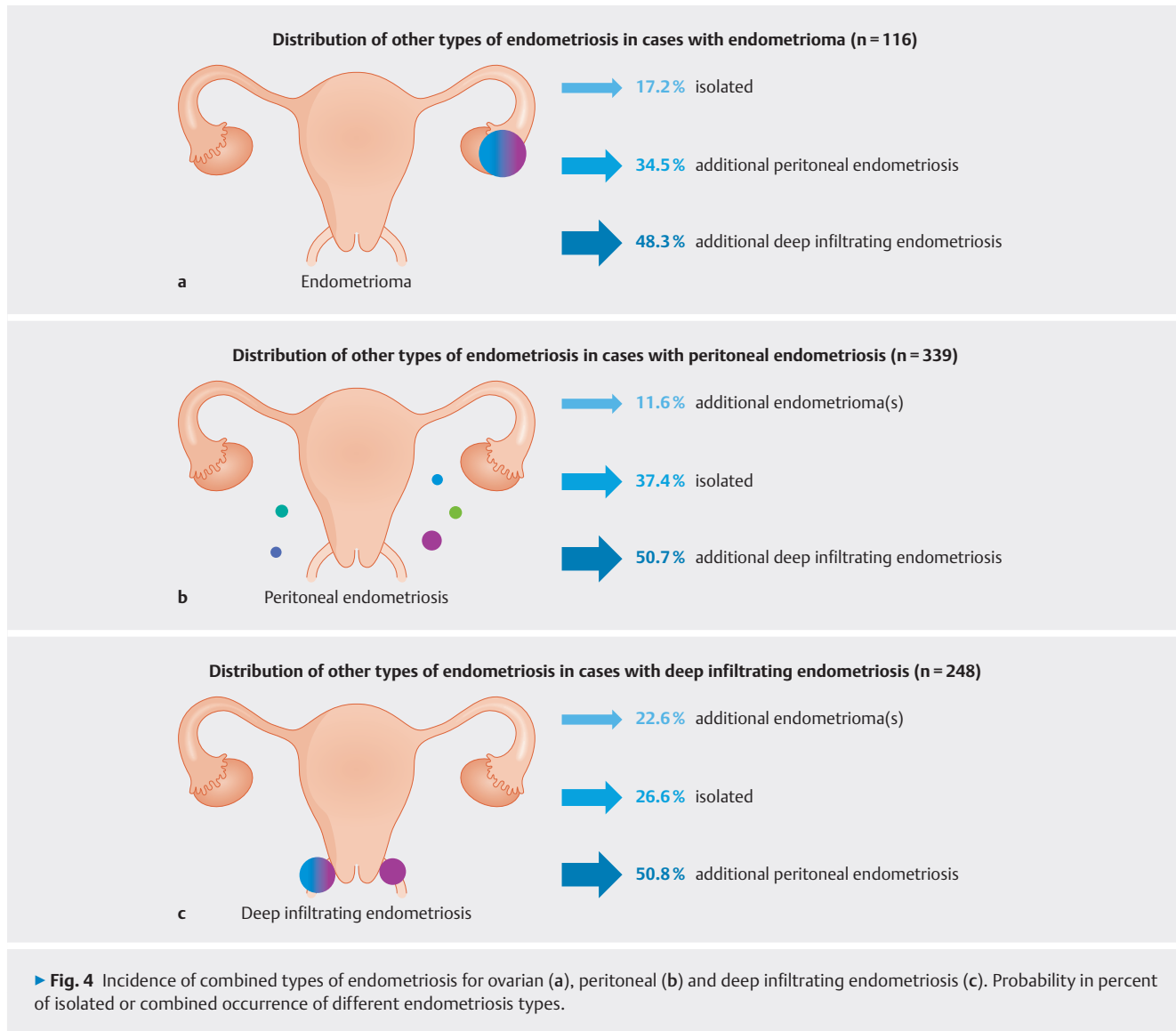
Endometriomas (n = 116), which were found in 26.7% of cases, were only present in isolation in 17.2% of cases. 34.5% of patients with endometrioma had concurrent peritoneal endometriosis and 48.3% had concurrent deep infiltrating endometriosis. This means that endometriomas were present with other concurrent types of endometriosis in 82.8% of cases (► **Fig. 4 a**).

In the majority of cases (n = 94, 81%), the endometriomas could be completely resected.

Ovariectomy or (unilateral) adnexal resection was carried out in five cases (4.3%). Coagulation/laser vaporization of the cyst was reported for four patients (3.4%). In two cases (1.7%), only puncture was carried out; two further cases (1.7%) were treated with a combination of enucleation and fenestration or puncture. The precise approach taken was not documented in 11 patients (9.5%).

Peritoneal endometriosis (n = 339), which was reported in 77.9% of cases, was found in isolation in 37.4% of cases, while concurrent DIE was recorded in 50.7% of cases and concurrent en-





ometrioma in 11.6% (► Fig. 4b). Resection was carried out in the majority of patients (87.3%). Coagulation alone was carried out in 4.4% of cases. The precise surgical treatment was not documented in 8.3% of cases.

A hysterectomy was carried out in 41 patients. In more than half of these patients (63.4%, n = 26), the procedure consisted of total hysterectomy. In 36.6% of cases (n = 15) the procedure was done as a supracervical hysterectomy. Wedge resection of the myometrium was recorded in another seven cases.

A total of 59 cases underwent bowel surgery: the number (37.3%) of segmental bowel resections and of shaving procedures was the same. The precise approach was not documented in 23.7% of cases. A primary preventive stoma was placed in 13.6% of cases.

Ureteral surgery was done in 31 cases. Ureterolysis was documented in 87.1% of cases. Four patients (12.9%) had (partial) ureteral resection, ureteral reimplantation, or partial bladder resection and one case was treated with nephrectomy.

### Complications and conversion rate

Perioperative complications were documented in 2.8% of all surgical interventions. The mean BMI of these patients was 27.4 kg/m<sup>2</sup>. Complications requiring revision were only reported in 0.9% of cases. Two patients had a secondary hemorrhage and two further cases had bowel ischemia. One case required subsequent surgery with placement of a stoma due to anastomotic insufficiency. Intraoperative complications were reported for a further 0.9% of cases (two injuries of the urinary tract [ureter/bladder] as well as one case with unplanned opening of the vaginal wall and one case with injury of the epigastric artery). Lesser complications which did not require revision surgery included two wound infections and one urinary tract infection.

Emergency conversion from laparoscopy to laparotomy was only required in three cases (0.7%).

## Discussion

With QS ENDO pilot it has been possible for the first time to record the surgical care provided in the certified endometriosis centers of the DACH region.

The recent publication of data on patients' history and the diagnostic workup showed major deficits even in certified endometriosis centers [3]. Now the results of surgical procedures carried out in the centers are being evaluated and presented. This is the first multicenter survey which shows the actual surgical approaches used in a defined cohort. The evaluated institutions are certified level II and III endometriosis centers of the DACH region and therefore institutions which, per se, stand for very high surgical quality.

The analysis of the surgical data of 435 patients shows several associations which cannot claim to have a causal connection. They are discussed below. Despite a median age of 34 years, a prior pregnancy was only reported for 27.6% of patients. This corresponds to the known association between endometriosis and the unfulfilled wish to have children [16]. In our cohort, 72.4% of patients with a median age of 34 were childless, although according to the German Federal Statistical Office 47% of women in the general population aged 30–34 years are childless [17]. Even though it is possible that some of the patients will become pregnant, it is nevertheless possible to conclude that endometriosis patients are older at the birth of the first child than would usually be expected in the general population.

With a caesarean section rate of 42.5%, the rate in our cohort was more than 10% higher than the comparable rates for the overall populations in the DACH region. This suggests that endometriosis could be playing a causal role. Patients with endometriosis also have a significantly higher risk of delivering by caesarean section as was evidenced by a large meta-analysis of more than 3 million women which had an OR of 1.8 [18]. We can only speculate to what extent this significantly higher figure is associated with later confirmation of endometriosis. Plausible reasons could include major uncertainty because of a previous history of pain, fear of peripartum pain as well as psychosocial factors. The current German-language guideline recommends delivery by caesarean section in only a few exceptional cases. Ultimately, the data does not allow a clear recommendation to be made for a specific mode of delivery, even in cases with existing or resected rectal endometriosis [8].

The data of our cohort showed a high level of agreement for the treatment of peritoneal and ovarian endometriosis with guideline recommendations.

The surgical approach used to treat endometriomas was a cystectomy in more than 80% of cases. For peritoneal endometriosis, the resection rate was more than 85%. In terms of the chosen surgical technique, these rates suggest that surgeons in the endometriosis centers are guided by current therapeutic recommendations [11, 19]. It is clear that these results and findings cannot simply be transferred to all gynecological surgeons working in German-speaking countries. The QS ENDO study aims to clarify this.

Additional endometriosis lesions were identified in more than 80% of cases with endometriomas. Just under half of these cases

(48.3%) also had deep infiltrating endometriosis. These figures correspond to the sonographic data reported for a Swedish cohort. Out of a total of 125 cases with endometriomas in that cohort, 70 patients (56.0%) had concurrent deep infiltrating endometriosis [20]. In a Chinese cohort with recurrent endometriomas, 30.4% of cases had concurrent deep infiltrating endometriosis [21]. This should be an important consideration when discussing the planned surgery with patients with suspected endometriomas. Even if imaging or clinical examination has not provided evidence of deep infiltrating endometriosis, the patient should be informed about the possibility of undergoing one-stage surgery to resect as many of the endometriosis lesions as possible. This is the only way to avoid incomplete surgery for endometriosis, which can occur if the patient is not previously informed about the possibility of concurrent deep infiltrating endometriosis. It is important to avoid an unnecessary secondary operation.

With regards to hysterectomy procedures, the AWMF guideline rated supracervical and total hysterectomy procedures as equivalent as long as there was no concurrent DIE. In contrast, the ESHRE recommends performing a total hysterectomy. The endometriosis centers in German-speaking countries appear to be following the AWMF recommendation, because around one third (36.6%) of hysterectomy procedures carried out in our cohort were supracervical hysterectomy procedures. In accordance with the German guideline, none of these cases had concurrent DIE in compartments A, B or C. In other words: as required, all hysterectomy procedures carried out in patients with endometriosis in compartments A, B or C were total hysterectomies.

As both procedures have similarly low complication rates and the risk of a possible later prolapse is also similar [22], both types of hysterectomy are acceptable. However, even if a supracervical hysterectomy has been discussed with the patient, it is important to ensure that the patient has been informed about and given her consent to a total hysterectomy in the event of unexpected intraoperative findings.

The surgical procedures used to treat bladder and bowel endometriosis in our cohort were also found to be guideline compliant. Segmental resection and shaving of the anterior rectal wall were carried out approximately the same number of times to treat bowel endometriosis. Similarly, just under 90% of recorded ureterolysis procedures were found to comply with the guidelines, notwithstanding the fact that the AWMF guideline only recommends carrying out ureterolysis in the explanatory notes and did not issue a separate statement.

Our analysis was unable to find a correlation between the pain intensity of dysmenorrhea and the extent of endometriosis found intraoperatively. This confirmed the known problem of trying to estimate the extent of disease based on pain intensity [23]. There are some indications that adhesions correlate more strongly with dysmenorrhea than the stage of endometriosis [24]. Overall, the high NAS values which averaged more than six out of 10 on the pain scale are a testament to the level of suffering experienced by patients.

Our group recently showed that targeted taking of patients' history using a patient questionnaire has a high sensitivity (90.4%) for predicting the presence of endometriosis [25]. The pain intensity can therefore function as a discriminating param-



ter, although no conclusions can be drawn about the extent of disease. A study from New Zealand found that if medical staff played down the extent of pain, this led to longer delays in diagnosis [26]. Irrespective of any connection between pain intensity and the extent of endometriosis, it is undisputed that all patients report pronounced pain with a consistent median score of more than five on the NAS scale. The guideline therefore recommends that endometriosis centers use analog scales to obtain objective data about patients' pain [8].

The total rate of complications of 3% and the rate of complications requiring revision of 0.9% should be taken into account when counselling patients about their planned surgery. The same applies to the conversion rate from laparoscopy to laparotomy of less than 1%. In comparison, the conversion rate reported in an overview article by Magrina et al., which looked at more than 400 000 patients, was more than double at 2.1% [27]. The overall number of reported complications was low, meaning that the figures about a slightly higher average BMI in cases with complications should be treated with caution. In the literature, in addition to reports that obesity is linked to higher perioperative risks, there are also some reports which suggest that obesity without metabolic derangement could even have a protective aspect (this is also referred to as the "obesity paradox"). However, this hypothesis is still controversial [28].

Here again, the data from all surgical gynecology institutions in the DACH region should be collected in the context of the QS ENDO study and compared.

## Conclusion

In summary, it can be stated that the surgical approach used in the endometriosis centers of the DACH region largely follow the recommendations in the current guidelines. An analysis of the quality of care of all patients with endometriosis, two thirds of whom undergo surgery in non-certified institutions, will be carried out as part of the QS ENDO study. The aim must be to use multicenter studies to identify the surgical procedures which are best suited to different endometriosis stages and which offer patients with endometriosis the greatest benefit with regards to quality of life, pain reduction and preservation of the functions of the urinary tract, bowel and sexual organs.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

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