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Research Paper

Quality of life in patients with hemorrhoidal disease

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ABSTRACT

Background: Operation for hemorrhoidal disease is one of the most common operations performed globally. However, we know little about the impact of the disease on health-related quality of life (HRQoL), or the importance of the observed clinical and anatomical changes.

Method: This was a single-center cross-sectional and cohort study. HRQoL was assessed using the Short Form 12 and 36 (SF12 and SF36), EuroQoL 5-dimensions 5-levels (EQ-5D), and a disease specific questionnaire; Short Health Scale for Hemorrhoidal Disease (SHS_{HD}). SF12 and EQ-5D scores in 257 patients with symptomatic hemorrhoids referred to our proctologic outpatient clinic were compared to a Danish background population adjusting for age, gender, body mass index and educational status.

Symptoms were assessed using the Hemorrhoidal Disease Symptom Score. The anatomical pathology was graded using Goligher's classification. The associations between clinical characteristics and HRQoL were tested. The impact of surgical treatment was assessed in 111 patients followed one year postoperatively.

Results: Patients reporting a high symptom load had lower SF12 physical health scores compared with the background population. The EQ-5D indexes indicated impaired HRQoL in men, women <50 years and patients with higher education. Improvements in all three HRQoL measures were seen after surgery.

Symptom burden had a negative association with HRQoL measures, whereas the surgeon's grading of anatomical pathology had no association.

Conclusion: Hemorrhoidal disease has a negative impact on HRQoL related to the degree of symptoms. Surgical treatment improve the QoL. The surgeon's grading of anal pathology had no association with QoL.

Twitter handle:

This study shows that with increasing symptom burden, quality of life in patients with hemorrhoidal disease decreases to levels below the general population average. The anatomical grading of the disease does not reflect the disease burden experienced by the patients. Patient-reported outcomes are necessary in the assessment of hemorrhoidal disease.

Introduction

Hemorrhoidal disease (HD) is the most common proctologic pathology in adults. Estimates from Western European countries suggest that 17 % of adults suffer from symptomatic hemorrhoids [1], and approximately 50 per 100,000 adults undergo an operation for HD each year [2–4]. Hemorrhoids are enlargement of the anal cushions normally contributing to anal continence and located intra anally [5,6]. The term hemorrhoidal disease is used when the hemorrhoids cause symptoms [7].

Health-related quality of life (HRQoL) is the impact of health on quality of life and can be defined as "how well a person functions in their life and his or her perceived wellbeing in physical, mental, and social domains of health" [8,9].

As HD is a benign disease, the primary aim of its treatment is to resolve symptoms and improve patient wellbeing. HRQoL measures are frequently included as outcomes in clinical trials of HD treatments, and the impact on HRQoL can be used to evaluate the cost-effectiveness of an intervention [4]. However, we have limited knowledge on HRQoL in patients with HD compared to the background population. This comparison is important for an assessment of the burden of the disease, and the result can be used to compare the burden of HD to other benign diseases, and guide the use of health resources for its treatment.

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A few studies have been published but the results are inconsistent [10–13]. The impact on HRQoL of clinical characteristics such as degree of symptoms and anatomical grading of disease severity is scarcely investigated.

The aim of this study was to compare HRQoL in patients with hemorrhoidal disease with HRQoL in the general population. Secondly, we investigated the impact of clinical characteristics and surgical treatment on HRQoL.

Method

Patients. This was a cross-sectional (Cohort I) and longitudinal study (Cohort II) carried out at the Department of Surgery at Holbæk Hospital (Denmark). Patients referred to the proctologic outpatient clinic for anorectal complaints were assessed for eligibility. All patients (aged >16 years) diagnosed with HD were eligible for inclusion in Cohort I. The HRQoL measured in Cohort I was compared with the HRQoL in a background population and the impact of clinical anatomical characteristics were also examined. To study the impact of surgical treatment we used data from patients operated for HD (Cohort II). Patients in Cohort I that received an operation could be included in both cohorts. The operations used were on the surgeons discretion, and could be either Minimal open Hemorrhoidectomy (ablative) [14], LigaSure® Hemorrhoidectomy (ablative), or Transanal Hemorrhoidal Dearterialization (non-ablative).

The attending surgeon in the outpatient clinic identified potential participants. Hemorrhoidal disease was diagnosed based on patient history, clinical examination, and anoscopy. Sigmoidoscopy or colonoscopy was performed according to Danish guidelines: For patients' ≥40 years, endoscopy was mandatory, while in patients <40 years the decision to perform endoscopy was left to the surgeon's discretion. We excluded patients with acute HD (bleeding requiring admission, strangulated internal hemorrhoids and thrombosed external hemorrhoids), and patients with concomitant anal fistula or fissure, anal or rectal prolapse, inflammatory bowel disease, or colorectal or anal cancer.

The study had no influence on patient treatment. Patients received a letter informing them about the study, and they consented to participate by completing the questionnaires. The Regional Committee on Health Research Ethics (SJ-430/SJ348) and The Danish Data Protection Agency (REG-71-2013) approved the study. This paper adhere to the STROBE guidelines.

Measurements. Health-related quality of life (HRQoL) was assessed using the Optum™ Short Form 36 version 2® (SF36v2), EuroQoL 5-dimensions 5-levels (EQ-5D-5L), and the Short Health Scale adapted to hemorrhoidal disease (SHS_{HD}) [15–17]. SF36v2 and EQ-5D-5L are two of the most widely used generic HRQoL questionnaires. The SF36v2 questionnaire consists of 36 questions (items) that are used to calculate eight health domain scales: physical functioning (PF), role participation with physical health problems (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role participation with emotional health problems (RE), and mental health (MH). The health domain scales can be evaluated separately or used to calculate the mental and physical component summary measures (MCS and PCS). The EQ-5D-5L questionnaire has five dimensions (mobility, self-care, daily activities, pain/discomfort and anxiety/depression). The patients grade their problems or impairments in each dimension on a five-level scale, giving 5^5 (3125) possible health states. In addition, the patients report their self-rated health on a 0–100 visual analogue scale (EQ-VAS). The EQ-5D-5L health states were transformed to an index value (EQ-5D utility index) using the Danish Time-Trade-Off (TTO) value set [18]. In both the SF36v2 and EQ-5D-5L higher scores indicate better HRQoL. The SHS_{HD} is a disease-specific HRQoL instrument in patients with HD. The questionnaire has four items measuring overall symptom load, interference of symptoms with daily activities, disease-specific worries, and general wellbeing. Each item is graded on a seven-point Likert scale. Higher scores indicate a higher impact of HD on patients' daily life and wellbeing.

Symptoms were assessed using the Hemorrhoidal Disease Symptom Score (HDSS) [17]. HDSS measures the patient-reported frequency of pain, itching, bleeding, soiling and prolapse. Each symptom is graded 0–4 (0 = never, 1 = less than once a month, 2 = less than once a week, 3 = 1–6 days per week, 4 = every day-/-always) giving a total score from 0 to 20.

The attending surgeon graded the anatomical pathology based on patient history and clinical examination using Goligher's classification [19]. The surgeon also reported his or her global assessment of pathology on a seven-point Likert scale and registered data on symptom duration and previous treatments for HD.

Procedure. All questionnaires were written in Danish and administered on printed-paper. A letter describing the study was sent to all patients referred to the proctologic outpatient clinic. The letter stated the scheduled meeting time and included the questionnaires used in the study. The patients were asked to complete the questionnaires at home and return them to the outpatient clinic. In the event of non-compliance patients were asked to complete the questionnaires when attending the outpatient clinic. Patients operated for HD (Cohort II) completed the same questionnaires at planned follow-up one year after surgery. Any patient who did not want to attend the outpatient clinic at follow-up, was contacted by us and asked to send the questionnaires by mail.

Background population. Danish population norms for the EQ-5D utility index were published in 2009 [20]. Danish population norms for the SF36v2 are not available. To establish a comparison group we used data from the Danish Health Interview Survey 2017 (SUSY 2017), performed by the Danish National Institute of Public Health, University of Southern Denmark [21]. The survey was performed on a region-stratified, random sample of 25,000 Danish citizens (≥16 years). The questionnaires used in the SUSY 2017 were sent by electronic or paper mail and 14,022 citizens responded (response rate 56.1 %). The survey included the Optum™ Short Form 12 version 2® (SF12v2) questionnaire. SF12v2 is a simplified version of the SF36v2 questionnaire with 12 items used to calculate the physical and mental component measures.

Primary outcome. The primary outcome was the SF12v2 Physical Component and Mental Component Summary (Cohort I) compared with the background population (SUSY 2017). The SF12v2 scores of patients with HD (Cohort I) were extracted from the SF36v2 questionnaire.

Secondary outcomes. The secondary outcomes were the EQ-5D utility index (Cohort I) compared with the background population, the associations between clinical characteristics and HRQoL (Cohort I), and changes in HRQoL measures one year after an operation for HD (Cohort II). The clinical characteristics assessed were duration of symptoms, previous operation for HD, patient-reported symptoms, grade of prolapse (Goligher's classification), surgeon's global assessment of pathology, and allocated treatment (conservative vs. operation). The impact of surgical treatment was investigated comparing SHS_{HD}, SF36v2, and EQ-5D-5L scores before and one year after surgery.

Statistical analyses. Descriptive statistics described demographic data. Continuous data were tested for normality, and parametric (*t*-test) or non-parametric tests (Mann-Whitney *U* test (two samples) or Wilcoxon signed rank test (one sample)) were used depending on the distribution. Multiple linear regression analysis was performed to adjust for the confounding variables age, sex, and body mass index (BMI). When comparing with the general population we also adjusted for educational status, excluding patients aged <30 years. We excluded missing data in all analyses. Significance level was 0.05 (two-sided).

Statistical analyses were performed in IBM SPSS 24 (IBM Corp, Armonk, New York, USA) and SAS 9.4 (SAS institute, Cary, North Carolina, USA). SF36v2 scores were obtained using the QualityMetric™ scoring software (5.1).

Sample size estimates were obtained from the SF36v2 User's Manual [22]. According to this manual a difference of 2 points for the PCS and 3 points for the MCS are considered clinically relevant. To detect a difference in PCS and MCS of 2 points with significance level of 5 % and statistical power of 80 % required a sample size of 208–212 patients.

Results

Patients. From 15 January 2015 to 29 August 2017, 257 patients were included in Cohort I for a comparison with the background population (Fig. 1). In Cohort II, 123 patients operated for HD were included between 13 November 2013 and 24 August 2016. At one-year follow up, HRQoL data were obtained in 111 patients (90 %). Table 1 presents patient characteristics.

Comparison with background population. The SF12v2 Physical Component Score was lower in patients with HD but after adjustment for confounding variables (age, sex, BMI and educational status) no difference was found (Table 2). The Mental Component Score in patients with HD was higher compared with the background population. Patients reporting a high symptom load (HDSS >14) had lower SF12 v2 Physical Component Score compared with the background population (Table 3). Measured with the EQ-5D utility index HRQoL was lower in patients with HD compared with the background population and after adjustment for sex, age and educational status it stayed lower in men, women <50 years, and individuals with higher education (Table 4).

Impact of clinical and anatomical characteristics. The patient-reported frequency of symptoms (HDSS) showed an association with HRQoL (Table 5). The HDSS was associated with the EQ-5D utility index, five of the eight health domain scales (BP, GH, VT, SF, and MH) and both component summary measures (PCS and MCS) of the SF36v2. The SHS_{HD} was associated with all health domains scales, both component summary measures and the EQ-5D utility index. No association was found between HRQoL measures and grade of prolapse (Goligher's classification), surgeon's global assessment of pathology, or allocated treatment (conservative vs. operation).

Impact of surgical treatment. Symptoms improved after surgery (Table 1). The HDSS showed a mean improvement [CI95%] of −7.19 [−8.16 to −6.23] ($p < 0.001$). Four health domain scales and the mental component summary score of the SF36v2 improved one year after surgery (Fig. 2). The greatest improvement was seen in Bodily Pain (mean difference [CI95%]: 4.05 [2.05 to 6.05], $p < 0.001$). An improvement above minimal important difference (MID) of the physical component summary (MID: 2 points) was seen in 47 % of the patients and of the MCS (MID: 3 points) in 32 % of the patients. The EQ-VAS showed a mean improvement [CI95%] of 2.59 [−0.16 to 5.34] ($p = 0.064$), while the EQ-5D utility index showed a mean improvement [CI95%] of 0.042 [0.012 to 0.072] ($p = 0.006$). The SHS_{HD} had a mean improvement [CI95%] of −7.86 [−8.91 to −6.81] ($p < 0.001$).

Discussion

In the present study we compared health-related quality of life (HRQoL) in patients diagnosed with hemorrhoidal disease (HD) with the background population using two widely used generic self-reported questionnaires (SF12v2 and EQ-5D-5L). We found that HD was associated with a decrease in HRQoL. Although HRQoL measured by SF12v2 was not lower in patients with HD, the SF12v2 physical health scores were below the population average in patients with a high symptom burden. Moreover, the EQ-5D utility index was lower in patients with HD compared with the background population, except for women ≥50 years and patients without higher education. Improvements in most HRQoL measures were seen when HD was surgically treated.

Only a few studies have compared HRQoL in patients with HD with healthy controls. In general our results are in agreement with reports from other countries. In a Turkish study the bodily pain and vitality domain scores (Short Form 36) were lower in patients with hemorrhoids compared with healthy controls [13]. No differences were found for the physical and mental component summary measures. A national

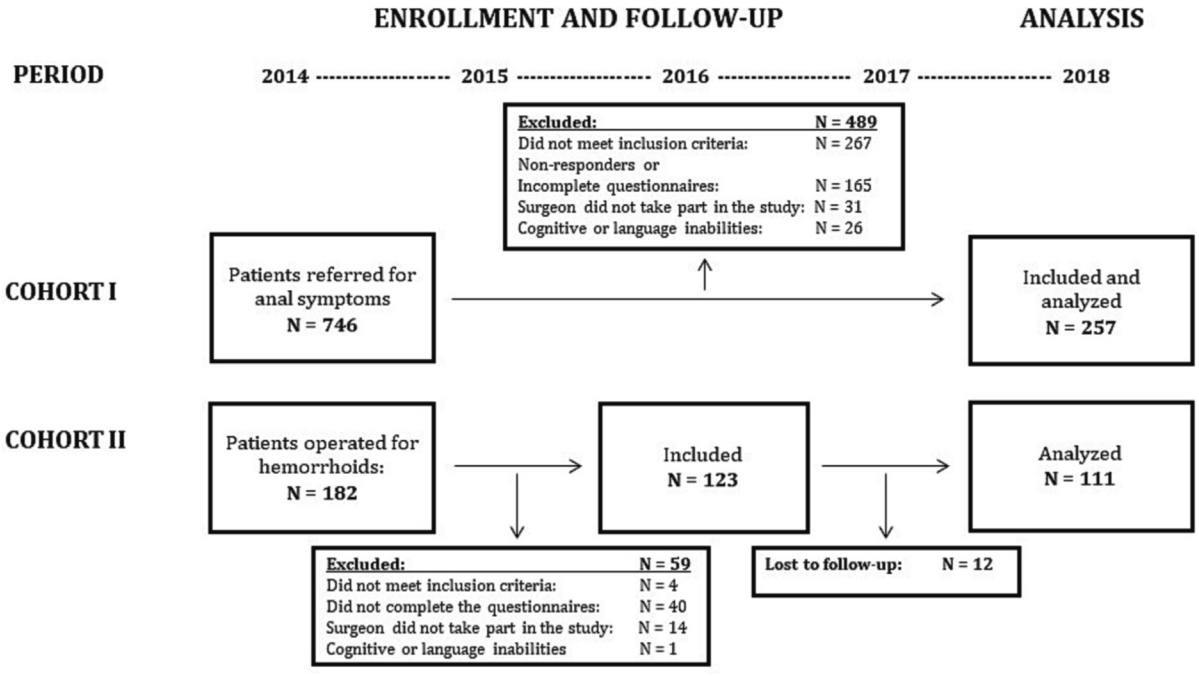

Fig. 1. Flow chart for inclusion of patients in Cohort I and Cohort II.

Table 1
Patient characteristics:

		Cohort I (N = 257)	Control group (SUSY 2017) (N = 14,022)	Cohort II (N = 123)	
Sex (M/F), N (%)		132 (51) / 125 (49)	6417 (49) / 7605 (51)	74 (60) / 49 (40)	
Age (years), mean (SD)		52.7 (15.6)	48.1 (19.3)	54.0 (14.1)	
BMI (kg/m^2), mean (SD) [Missing, N (%)]		26.8 (4.8) [17 (7)]	25.7 (4.9) [1273 (9)]	26.6 (4.4) [0 (0)]	
Educational status[a], N (%)	None	44 (17)	1634 (13)	17 (14)	
	Short (1–4 years)	163 (63)	7515 (48)	82 (67)	
	Long (>4 years)	23 (9)	1346 (9)	5 (4)	
	Missing / <30 years old	10 (4) / 17 (7)	1047 (9) / 2480 (22)	13 (11) / 6 (5)	
Goligher's classification, preoperatively N (%)	Grade I	66 (26)	–	1 (1)	
	Grade II	54 (21)	–	5 (4)	
	Grade III	64 (24)	–	47 (38)	
	Grade IV	73 (28)	–	70 (57)	
				Preoperative	**Postoperative (1 yr)**
Hemorrhoidal Disease Symptom Score (0–20), Mean (SD) [Missing, N (%)]		10.5 (4.3) [4 (2)]	–	12.1 (3.7) [1 (1)]	4.6 (4.3) [12 (10)]
Short Health Scale$_{HD}$ (4–28), Mean (SD) [Missing, N (%)]		13.9 (5.2) [6 (2)]	–	15.5 (4.6) [7 (6)]	7.6 (4.1) [14 (11)]
Treatment, N (%)	Conservative	157 (61)	–	0 (0)	
	Operation:	100 (39)	–	123 (100)	
	Minimal Open Hemorrhoidectomy	44 (17)		60 (49)	
	LigaSure® Hemorrhoidectomy	21 (8)		0 (0.0)	
	Transanal Hemorrhoidal Dearterialization	35 (14)		63 (51)	

[a] Level of higher education (Patients <30 years old were excluded). SUSY 2017 = Danish Health Interview Survey 2017.

health survey in South Korea reported an association between HD and lower EQ-5D scores [12]. That study is limited by the fact that a self-reported questionnaire set the diagnosis of HD. No association was found when the analysis was restricted to patients with HD diagnosed by a physician. Another study assessed HRQoL (using the Short Form 12) in patients attending the colorectal cancer-screening program in Austria [11]. No difference in HRQoL was found between patients with and without hemorrhoids. In contrast to our findings, the authors could not demonstrate a negative impact of hemorrhoidal symptoms. The Austrian patient population was, however, different from ours, as we included patients referred to a proctologic clinic for anal complaints. The majority of the patients included in the Austrian study (>90 %) had low grade of disease (Grade I and II). Moreover, symptoms were categorized as present or not present, while in the present study the symptoms were assessed using a symptom score [17].

Interestingly, we did not find an association between HRQoL measures and the anatomical pathology graded by the surgeon (Goligher's classification and global assessment of pathology) or allocated treatment (conservative vs. operation). These findings emphasize the importance of including patient-reported outcome measures in the evaluation of HD and are in line with previous findings, which showed that grade of prolapse and symptoms are poorly correlated [23]. The Short Health Scale$_{HD}$ showed significant association with all domains of the SF36v2 and the EQ-5D utility index, supporting its validity as a simplified HRQoL tool for patients with hemorrhoidal disease.

Interventions for HD are primarily aimed at treating symptoms and improving HRQoL. We found that after surgery patient-reported symptoms improved largely and improvements in HRQoL measures were also seen. The health domain scale bodily pain (level of pain and interference with normal activities) showed the greatest improvement. Several clinical trials on treatments for HD have reported changes in SF-36 or SF-12 scores postoperatively, and improvement in bodily pain is a consistent finding [24–28]. The changes found in the other health domain scales and the EQ-5D utility index were relatively small. Our results indicate that a disease-specific rather than a generic HRQoL instrument better demonstrate changes in HRQoL. Surgeons and researchers should be aware of this when choosing outcome measures for clinical trials or clinical practice. A disease-specific HRQoL instrument such as the SHS$_{HD}$ will most likely serve as a useful outcome measure. Recently, other HRQoL measures intended for proctologic diseases have also been presented [29,30].

The strength of the present study is that the patients were included consecutively and examined by surgeons experienced in the treatment of proctologic diseases. HRQoL was assessed by both a disease-specific

TABLE 2
Comparison of HRQoL (SF12v2) between patients with hemorrhoidal disease (Cohort I) and the general population (SUSY 2017).

	Hemorrhoidal disease (Cohort I) Mean [CI95%]	General population (SUSY 2017) Mean [CI95%]	Calculated difference[a] [CI95%]	*p*
UNADJUSTED	N = 257	N = 12,217		
Mental Component Summary	51.05 [49.71 to 52.40]	48.40 [48.20 to 48.59]	2.65 [1.31 to 4.00]	**<0.001**
Physical Component Summary	47.79 [46.53 to 49.04]	50.40 [50.22 to 50.58]	−2.61 [−3.87 to −1.36]	**<0.001**
ADJUSTED FOR AGE, SEX AND BMI	N = 238	N = 11,406		
Mental Component Summary			2.16 [0.81 to 3.51]	**0.0017**
Physical Component Summary			−1.17 [−2.37 to 0.02]	0.054
ADJUSTED FOR AGE, SEX, BMI and EDUCATIONAL STATUS[b]	N = 230	N = 11,135		
Mental Component Summary			2.01 [0.66 to 3.36]	**0.0034**
Physical Component Summary			−1.14 [−2.40 to 0.12]	0.076

HRQoL = Health-Related Quality of Life; SF12v2 = Short Form 12 version 2; SUSY 2017 = Danish Health Interview Survey 2017.
[a] Negative difference indicates decreased HRQoL.
[b] Individuals < 30 years excluded.

Table 3
HRQoL (SF12v2) related to the severity of symptoms (HDSS) in patients with hemorrhoidal disease (Cohort I) compared with a general population (SUSY 2017).

		Calculated difference[b] [CI95%]	*p*
Mental Component Summary (SF12v2)			
COHORT I[a]	HDSS 1–7	4.82 [2.10 to 7.54]	**0.001**
	HDSS 8–11	1.14 [−1.35 to 3.63]	0.6
	HDSS 12–14	1.35 [−1.09 to 4.21]	0.2
	HDSS 15–20	1.21 [−1.82 to 4.25]	0.4
SUSY 2017		Reference	
Physical Component Summary (SF12v2)			
COHORT I[a]	HDSS 1–7	−0.12 [−2.52 to 2.29]	0.9
	HDSS 8–11	0.17 [−2.03 to 2.37]	0.9
	HDSS 12–14	−2.03 [−4.37 to 0.32]	0.09
	HDSS 15–20	−4.37 [−7.05 to −1.69]	**0.001**
SUSY 2017		reference	

HRQoL = Health-Related Quality of Life; SF12v2 = Short Form 12 version 2; HDSS = Hemorrhoidal Disease Symptom Score; SUSY 2017 = Danish Health Interview Survey 2017.
[a] Patients in Cohort I divided in quartiles based on HDSS.
[b] Adjusted for age, sex, BMI and educational status excluding individuals <30 years. Negative difference indicates decreased HRQoL.

HRQoL instrument (SHS_{HD}) and two of the most widely used generic questionnaires (SF36 and EQ-5D). Generic HRQoL instruments might be less sensitive to changes in HRQoL caused by a specific condition. However, generic HRQoL instruments enable comparison with healthy subjects and the wide use of SF36 and EQ-5D allows comparison with other studies. The limitations are our relatively high rate of non-responders, even though we asked the patients twice to participate. The rate of non-responders was even greater in the background population sample (43.9 %). A selection bias might have caused the finding of a higher Mental Component Summary in the patients with HD, because the patients included were patients referred to a proctologic outpatient clinic. Studies have shown that many patients with proctologic symptoms conceal their complaints and fail to seek medical advice [31]. A difference in characteristics may exist in patients that do and do not seek medical advice for their complaints. We did not compare HRQoL after surgery with for example conservative treatment in a randomized design. However, our results indicate that when surgery reduce the symptoms, HRQoL improves. The population in the present study should reflect the population seen by most colorectal or general surgeons, but the results cannot necessarily be extrapolated to all patients with hemorrhoids.

Conclusion

Hemorrhoidal disease has a negative impact on quality of life, which is related to the degree of symptoms. Quality of life is improved after surgical treatment.

The surgeon's grading of anal pathology had no association with quality of life.

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Ethical approval

The Regional Committee on Health Research Ethics (SJ-430/SJ348) and The Danish Data Protection Agency (REG-71-2013) approved the study.

CRediT authorship contribution statement

HR drafted the protocol, achieved the needed permissions, collected the data, performed the analysis, drafted the manuscript, revised the manuscript and approved the final manuscript.

MD revised the protocol, analyzed the data, critically revised the drafted manuscript, and approved the final manuscript.

MG revised the protocol, collected the data, critically revised the drafted manuscript, and approved the final manuscript.

BB revised the protocol, raised the funds, supervised the study, critically revised the drafted manuscript, and approved the final manuscript.

GO drafted the protocol, raised the funds, supervised the study, collected data, critically revised the drafted manuscript, and approved the final manuscript.

Declaration of competing interest

All authors declare, that they have no conflicts of interest.

Table 4
Comparison of HRQoL (EQ-5D utility index) between patients with hemorrhoidal disease (Cohort I) and a general population.

		Hemorrhoidal disease (Cohort I)		General population[a]		Calculated difference[b] [CI95%]	*p*
TOTAL		N	Mean (SD)	N	Mean (SD)		
EQ-5D Utility Score (0–1)		250	0.793 (0.148)	15,700	0.887 (<0.001)	−0.094 [−0.112 to −0.076]	**<0.001**
MEN		N	Mean (SD)	N	Mean (SD)		
Age < 50 years	EQ-5D Utility Score (0–1)	42	0.780 (0.172)	1562	0.908 (0.134)	−0.128 [−0.182 to −0.074]	**<0.001**
Age 50–69 years	EQ-5D Utility Score (0–1)	56	0.805 (0.109)	1012	0.883 (0.153)	−0.078 [−0.119 to −0.037]	**<0.001**
Age ≥ 70 years	EQ-5D Utility Score (0–1)	30	0.777 (0.131)	667	0.847 (0.183)	−0.070 [−0.121 to −0.019]	**0.008**
WOMEN		N	Mean (SD)	N	Mean (SD)		
Age < 50 years	EQ-5D Utility Score (0–1)	64	0.789 (0.180)	1702	0.881 (0.159)	−0.092 [−0.138 to −0.046]	**<0.001**
Age 50–69 years	EQ-5D Utility Score (0–1)	42	0.804 (0.136)	1109	0.839 (0.177)	−0.035 [−0.079 to 0.009]	0.11
Age ≥ 70 years	EQ-5D Utility Score (0–1)	16	0.810 (0.127)	741	0.818 (0.198)	−0.008 [−0.077 to 0.061]	0.81
HIGHER EDUCATION[c]		N	Mean (SD)	N	Mean (SD)		
None	EQ-5D Utility Score (0–1)	40	0.805 (0.129)	2879	0.842 (0.189)	−0.037 [−0.079 to 0.005]	0.08
Short	EQ-5D Utility Score (0–1)	161	0.792 (0.148)	6642	0.885 (0,150)	−0.093 [−0.116 to 0.070]	**<0.001**
Long	EQ-5D Utility Score (0–1)	22	0.805 (0.147)	2858	0,912 (0,130)	−0.107 [−0.172 to −0.042]	**0.003**

HRQoL = Health-Related Quality of Life; EQ-5D = EuroQoL 5-dimensions.
[a] Sørensen J, Davidsen M et al. Danish EQ-5D population norms. *Scand J Public Health*. 2009 Jul 17;37(5):467–74.
[b] Negative difference indicates decreased HRQoL.
[c] Length of higher education. Individuals <30 years excluded.

Table 5
The impact of clinical characteristics on HRQoL measured by SF36 version 2 and Danish EQ-5D utility index (Time Trade Off).

Clinical characteristics		Physical functioning	Role-Physical	Bodily pain	General health	Vitality	Social functioning	Role-Emotional	Mental health	Mental component summary	Physical component summary	EQ-5D Utility Index[1]
Symptom duration (months)		0.06 [−0.18 to 0.30]	**0.34*** **[0.03 to 0.65]**	−0.10 [−0.44 to 0.24]	0.12 [−0.21 to 0.45]	0.07 [−0.27 to 0.41]	0.05 [−0.23 to 0.32]	0.26 [−0.05 to 0.56]	0.11 [−0.17 to 0.40]	0.17 [−013 to 0.48]	0.03 [−0.27 to 0.33]	0.00 [−0.02 to 0.02]
Previous operation (no or yes)		−1.08 [−4.12 to 1.96]	−0.25 [−4.07 to 3.56]	−3.47 [−7.39 to 0.44]	−1.73 [−5.59 to 2.12]	−2.59 [−6.65 to 1.46]	1.51 [−1.94 to 4.97]	1.93 [−1.70 to 5.57]	−0.01 [−3.45 to 3.42]	1.18 [−2.57 to 4.92]	−3.25 [−6.99 to 0.50]	−0.004 [−0.01 to 0.01]
HDSS (0–20 points)		−0.18 [−0.40 to 0.04]	−0.21 [−0.50 to 0.07]	**−0.81*** ** **[−1.09 to − 0.53]**	**−0.40** ** **[−0.68 to − 0.12]**	**−0.44** ** **[−0.74 to − 0.15]**	**−0.41** ** **[−0.66 to − 0.16]**	−0.12 [−0.39 to 0.14]	**−0.32*** **[−0.57 to − 0.07]**	**−0.35*** **[−0.62 to − 0.08]**	**−0.38** ** **[−0.65 to − 0.11]**	**−0.88*** ** **[−1.31 to 0.45]**
Symptom load (1–7 points)		**−1.35*** ** **[−1.95 to − 0.75]**	**−1.68*** ** **[−2.45 to − 0.92]**	**−2.74*** ** **[−3.48 to − 2.00]**	**−1.51*** ** **[−2.29 to − 0.74]**	**−1.77*** ** **[−2.57 to − 0.97]**	**−1.84*** ** **[−2.52 to − 1.17]**	**−0.99** ** **[−1.74 to − 0.25]**	**−1.62*** ** **[−2.29 to − 0.94]**	**−1.30*** ** **[−2.05 to − 0.56]**	**−2.02*** ** **[−2.75 to − 1.29]**	**−2.99*** ** **[−4.14 to − 1.84]**
SHS_{HD} (4–28 points)		**−0.55*** ** **[−0.73 to − 0.37]**	**−0.72*** ** **[−0.94 to − 0.49]**	**−0.95*** ** **[−1.17 to − 0.73]**	**−0.63*** ** **[−0.85 to − 0.40]**	**−0.68*** ** **[−0.92 to − 0.44]**	**−0.74*** ** **[−0.94 to − 0.54]**	**−0.47*** ** **[−0.68 to − 0.25]**	**−0.64*** ** **[−0.83 to − 0.45]**	**−0.58*** ** **[−0.79 to − 0.36]**	**−0.76*** ** **[−0.98 to − 0.55]**	**−1.24*** ** **[−1.57 to − 0.91]**
Goligher's classification	Grade I	1.22 [−1.50 to 3.94]	0.17 [−3.27 to 3.60]	1.81 [−1.73 to 5.36]	1.57 [−1.90 to 5.04]	2.04 [−1.57 to 5.64]	0.34 [−2.77 to 3.46]	0.56 [−2.68 to 3.81]	−0.03 [−3.12 to 3.06]	−0.39 [−3.71 to 2.93]	1.65 [−1.69 to 4.98]	1.27 [−4.04 to 6.59]
	Grade II	−0.60 [−3.41 to 2.20]	−2.92 [−6.47 to 0.64]	−1.44 [−5.10 to 2.23]	−1.16 [−4.74 to 2.41]	−0.85 [−4.57 to 2.86]	−1.22 [−4.42 to 1.99]	−1.76 [−5.14 to 1.63]	−0.34 [−3.52 to 2.84]	−0.91 [−4.39 to 2.57]	−2.64 [−6.13 to 0.86]	−2.74 [−8.30 to 2.82]
	Grade III	−1.54 [−4.23 to 1.15]	−1.62 [−5.03 to 1.79]	0.17 [−3.34 to 3.69]	−1.21 [−4.64 to 2.23]	0.07 [−3.50 to 3.65]	−0.86 [−3.95 to 2.23]	−1.53 [−4.75 to 1.69]	−0.001 [−3.06 to 3.06]	−0.62 [−3.9 to 2.66]	−2.06 [−5.35 to 1.24]	−4.30 [−9.53 to 0.92]
	Grade IV	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	reference
Surgeon's global assessment of pathology (1–7 points)		−0.43 [−1.20 to 0.35]	0.06 0.91 to 1.04]	−0.06 [−1.07 to 0.94]	−0.17 [−1.16 to 0.82]	0.12 [−0.89 to 1.13]	0.04 [−0.84 to 0.92]	−0.04 [−0.96 to 0.88]	0.56 [−0.31 to 1.42]	0.62 [−0.31 to 1.55]	−0.43 [−1.39 to 0.52]	0.36 [−1.09 to 1.80]
Operative treatment (no or yes)		−0.22 [−2.25 to 1.81]	−0.06 [−2.63 to 2.51]	−0.42 [−3.07 to 2.22]	−1.78 [−4.35 to 0.80]	−1.49 [−4.17 to 1.19]	0.18 [−2.14 to 2.49]	0.43 [−2.00 to 2.85]	0.39 [−1.90 to 2.68]	0.65 [−1.82 to 3.12]	−0.91 [−3.42 to 1.60]	−0.269 [−4.25 to 3.71]

Calculated impact [CI 95 %] per unit increase in linear regression model adjusting for sex, age and body mass index. $^{*}p < 0.05$ $^{**}p < 0.01$ $^{***}p < 0.001$. [1]EQ-5D utility index was multiplied by 100.
HRQoL = Health-Related Quality of Life; HDSS = Hemorrhoidal Disease Symptom Score; Symptom load = Overall symptom load on 7-point Likert scale; SHS_{HD} = Short Health Scale adapted for hemorrhoidal disease.

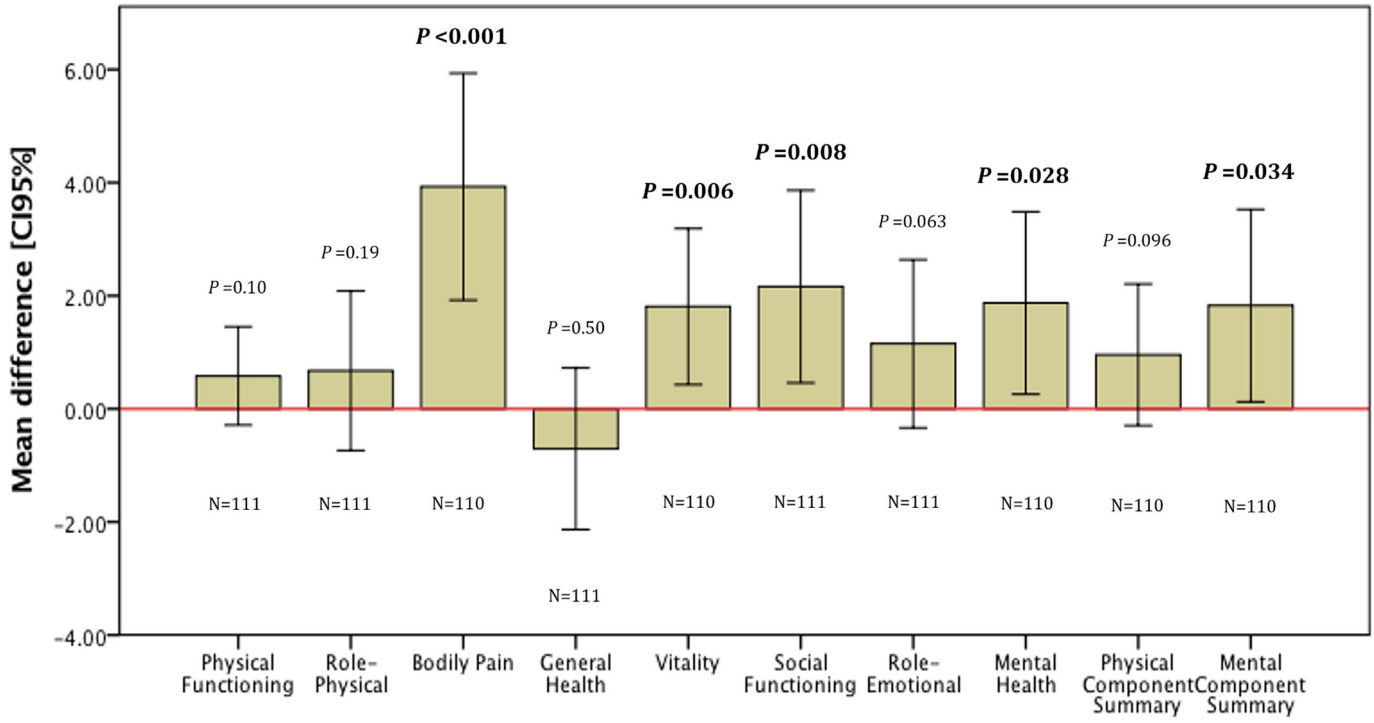

Fig. 2. The impact of surgery on HRQoL. Mean difference [CI95%] in Short Form 36 version 2 scores preoperatively and one year after surgery. A positive difference indicates improvement of HRQoL.

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References

[1] Riss S, Weiser FA, Schwameis K, Riss T, Mittlböck M, Steiner G, et al. The prevalence of hemorrhoids in adults. Int J Colorectal Dis. 2012;27:215–20.
[2] Bussen D, Herold A, Bussen S. Health-related quality of life after surgical haemorrhoid treatment - results, methods and problems. Zentralbl Chir. 2012; 137:385–9.
[3] Lehur PA, Didnée AS, Faucheron JL, et al. Cost-effectiveness of new surgical treatments for hemorrhoidal disease a multicentre randomized controlled trial comparing transanal doppler-guided hemorrhoidal artery ligation with mucopexy and circular stapled hemorrhoidopexy. Ann Surg. 2016;264:710–6.
[4] Watson AJ, Cook J, Hudson J, et al. A pragmatic multicentre randomised controlled trial comparing stapled haemorrhoidopexy with traditional excisional surgery for haemorrhoidal disease: the eTHoS study. Health Technol Assess (Rockv). 2017;21: 1–224.
[5] Thomson WH. The nature of haemorrhoids. Br J Surg. 1975;62:542–52.
[6] Lestar B, Penninckx F, Kerremans R. The composition of anal basal pressure. An in vivo and in vitro study in man. Int J Colorectal Dis. 1989;4:118–22.
[7] Haas PA, Haas GP, Schmaltz S, Fox TA. The prevalence of hemorrhoids. Dis Colon Rectum. 1983;26:435–9.
[8] Karimi M, Brazier J. Health, health-related quality of life, and quality of life: what is the difference? Pharmacoeconomics. 2016;34:645–9.
[9] Hays RD, Reeve BB. Measurement and modeling of health-related quality of life. Int. Encycl. Public Heal. Elsevier; 2017. p. 570–8.
[10] Sailer M, Bussen D, Debus ES, Fuchs KH, Thiede A. Quality of life in patients with benign anorectal disorders. Br J Surg. 1998;85:1716–9.
[11] Riss S, Weiser FA, Riss T, Schwameis K, Mittlböck M, Stift A. Haemorrhoids and quality of life. Colorectal Dis. 2011;13:e48–52.
[12] Lee J-H, Kim H-E, Kang J-H, Shin J-Y, Song Y-M. Factors associated with hemorrhoids in korean adults: korean national health and nutrition examination survey. Korean J Fam Med. 2014;35:227–36.
[13] Sit M, Yilmaz EE, Canan F, Yıldırım O, Cetin MM. The impact of type D personality on health-related quality of life in patients with symptomatic haemorrhoids. Przegląd Gastroenterol. 2014;9:242–8.
[14] Roervik H, Campos A, Ilum L, Styr K, McKinstry G, Brandstrup B, et al. Minimal open haemorrhoidectomy. Tech Coloproctol. 2019;23:73–7.
[15] Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30:473–83.
[16] Herdman M, Gudex C, Lloyd A, Janssen M, Kind P, Parkin D, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). Qual Life Res. 2011;20:1727–36.
[17] Rørvik HD, Styr K, Ilum L, McKinstry GL, Dragesund T, Campos AH, et al. Hemorrhoidal Disease Symptom Score and Short Health ScaleHD: new tools to evaluate symptoms and health-related quality of life in haemorrhoidal disease. Dis Colon Rectum. 2019;62:333–42.
[18] Wittrup-Jensen KU, Lauridsen J, Gudex C, Pedersen KM. Generation of a Danish TTO value set for EQ-5D health states. Scand J Public Health. 2009;37:459–66.
[19] Goligher JC. Surgery of the anus, rectum and colon. 2nd ed. London: Ballière, Tindall and Cassell LTD; 1967.
[20] Sørensen J, Davidsen M, Gudex C, Pedersen KM, Brønnum-Hansen H. Danish EQ-5D population norms. Scand J Public Health. 2009;37:467–74.
[21] Amalie H, Jensen R, Ekholm O, Davidsen M, Christensen AI. The Danish health and morbidity surveys: study design and participant characteristics. BMC Med Res Methodol. 2019;9:1–8.
[22] Maruish M. User's manual for the SF-36v2 health survey. 3rd editio. Lincoln, RI, USA: QualityMetric; 2011.
[23] Gerjy R, Lindhoff-Larson A, Nyström PO. Grade of prolapse and symptoms of haemorrhoids are poorly correlated: result of a classification algorithm in 270 patients. Colorectal Dis. 2008;10:694–700.
[24] Martinsons A, Narbuts Z, Brunenieks I, Pavars M, Lebedkovs S, Gardovskis J. A comparison of quality of life and postoperative results from combined PPH and conventional haemorrhoidectomy in different cases of haemorrhoidal disease. Colorectal Dis. 2007;9:423–9.
[25] Bouchard D, Abramowitz L, Castinel A, Suduca JM, Staumont G, Soudan D, et al. One-year outcome of haemorrhoidectomy: a prospective multicentre French study. Colorectal Dis. 2013;15:719–26.
[26] Thaha MA, Campbell KL, Kazmi SA, Irvine LA, Khalil A, Binnie NR, et al. Prospective randomised multi-centre trial comparing the clinical efficacy, safety and patient acceptability of circular stapled anopexy with closed diathermy haemorrhoidectomy. Gut. 2009;58:668–78.
[27] Tsunoda A, Takahashi T, Kusanagi H. A prospective randomized trial of transanal hemorrhoidal dearterialization with mucopexy versus ultrasonic scalpel hemorrhoidectomy for grade III hemorrhoids. Tech Coloproctol. 2017;21:657–65.
[28] Garg PK, Kumar G, Jain BK, Mohanty D. Quality of life after stapled hemorrhoidopexy: a prospective observational study. Biomed Res Int. 2013;2013:903271.
[29] Vander Mijnsbrugge GJ, Molenaar C, Buyl R, Westert G, van der Wees PJ. How is your proctology patient really doing? Outcome measurement in proctology: development, design and validation study of the Proctoprom. Tech Coloproctol. 2020;24:291–300.
[30] Abramowitz L, Bouchard D, Siproudhis L, Trompette M, Pillant H, Bord C, et al. Psychometric properties of a questionnaire (HEMO-FISS-QoL) to evaluate the burden associated with haemorrhoidal disease and anal fissures. Colorectal Dis. 2019;21:48–58.
[31] Tournu G, Abramowitz L, Couffignal C, et al. Prevalence of anal symptoms in general practice: a prospective study. BMC Fam Pract. 2017;18:1–7.