Title

Epidemiological trends in surgery for rectal prolapse in England 2001-2012: An adult hospital population-based study.

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Abstract

Background: This study analysed trends in admission and surgery for rectal prolapse in adults in England between 2001 and 2012 as well as prolapse reoperation rates.

Methods: Analysis of data derived from a comparative longitudinal population-based cohort study using Hospital Episode Statistics (HES).

Results: During the study period, a total of 25,238 adults underwent a total of 29,379 operations for rectal prolapse (mean 2,662 per annum) [median age 73 years (IQE 58-83) years; female to male ratio: 7:1]. Median length-of-stay was 3 days (IQR 1-7) with an overall in-hospital mortality rate of 0.9%. Total number of admissions (2001: 4,950 vs. 2012: 8,927) and of patients undergoing prolapse surgery (2001: 2,230 vs. 2012: 2,808) significantly increased over the study period ($P < 0.001$ for trends). The overall increase in prolapse surgery (up by 1/3rd overall and 44% for elective) was dwarfed by an increase in popularity of laparoscopic surgery (increasing 15-fold). Overall prolapse reoperation rate was 12.7%. The lowest recurrence rate was observed for elective open resection (9.1%) but this had the highest mortality (1.9%). Laparoscopic and perineal fixations were also associated with low reoperation rates (<11%) but lower mortality rates, in the order of 0.3% for elective surgery. These data refute a trend toward subspecialisation (by surgeon or hospital) during the study period.

Conclusions: Admissions for rectal prolapse increased in England between 2001-2012 together with increases in surgery. Surgical decision making has changed over the period and may be reflected in outcome.

What does this paper add to the existing literature?

This is the largest dataset of patients undergoing surgery for rectal prolapse, studying over 25,000 patients. The incidence of rectal prolapse and surgical repair in England has increased between 2001 and 2012. Laparoscopic fixation has increased dramatically in popularity and has favourable outcomes in terms of length-of-stay, mortality and reoperation rates.

Introduction

Rectal prolapse is an uncommon but highly morbid condition in which a full-thickness intussusception of the rectal wall extrudes through the anal canal [1-3]. The only potentially curative treatment is surgery with exceptions being patients considered medically unfit for surgery and those with minor degrees of prolapse. Over 100 operations for rectal prolapse repair have been described and none has achieved primacy following attempts to provide high quality evidence[4]. Rectal prolapse can be repaired via the abdomen or perineum with several alternatives for each described. Abdominally, posterior rectopexy (sacral fixation of the rectum) is generally considered to have a low recurrence rate but may result in poor function especially constipation [5]. Alternatively, the rectum may be fixed with concomitant segmental colonic resection (resection rectopexy) but there is a risk of anastomotic leak 1-5.9% [6, 7] even though some data suggest it has the lowest recurrence rate[4]. Perineal approaches (principally Delormes and Altemeier's) are less invasive and are considered a better option for elderly and medically unfit patients. However these may have higher recurrence rates 10 -30% compared to 0-11% for rectopexy[8].

Laparoscopic rectopexy was first reported in 1992 by Berman and has re-popularised the abdominal approach[9]. Laparoscopic ventral mesh rectopexy (LVMR) uses an anterior rectal dissection with fixation of the anterior rectal wall to a mesh, which is then anchored to the sacrum. The operation theoretically preserves pelvic nerves avoiding the 'rectal inertia' caused by posterior dissection and reportedly better functional outcome [10]. Several large series have now been published suggesting low recurrence rates and lower short-term morbidity[11-13], however this operation has recently become the subject of media scrutiny in relation to long-term complications from the use of pelvic mesh in general[14, 15].

The current study evaluated trends in surgery for rectal prolapse in England from 2001 to 2012 with a focus on type of operation performed and estimates of recurrence based on incidence of re-operation.

Methods

Study design

The study examined a national dataset (below) to obtain data pertaining to trends in incidence of rectal prolapse diagnosis and operations performed for prolapse by year. Patients undergoing an index prolapse procedure were followed up longitudinally to determine if they underwent further operations for rectal prolapse. As such, the study had elements of a multiple cross-sectional and retrospective cohort design.

Data sources

Hospital Episode Statistics (HES) data were obtained from the National Health Service Information Centre (NHSIC) and imported into Microsoft SQL server. All patients admitted with rectal prolapse over an 11-year period (April 2001 and March 2012) were identified by searching the primary diagnostic codes (K622 for anal prolapse and K623 for rectal prolapse) using the International Classification of Diseases Version 10 (ICD 10). Data were then imported into Microsoft Access [Microsoft Corp. USA] for analysis. Patients who underwent surgery for rectal prolapse were then selected by searching the Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (4th revision) codes (OPCS-4). Codes used are listed in suppl. table 1. Patients under the age of 16 were excluded from analysis. It is noted that there are no HES diagnostic codes for internal prolapse (intussusception) and the cohort will almost certainly have included some patients undergoing procedures for this diagnosis e.g. those undergoing stapled rectal resection (STARR) procedures. These patients represented less than 1% of the whole cohort (n=201).

Patients were subdivided by type of surgical repair into 6 categories using OPCS codes. Open fixation, open resection, laparoscopic fixation (laparoscopic codes plus open fixation), laparoscopic resection (laparoscopic codes plus open resection), perineal fixation, and perineal resection. Codes for each group are described in suppl. table 1. Laparoscopic repair was identified by searching all operative codes for Y75* or Y508* using the OPCS code 4. Converted cases were included with the laparoscopic approach by searching for the codes

Y714* or Y718*. Patients were then subdivided into elective and emergency repair by mode of admission using the "admimeth" field to identify how the patient was admitted to hospital (for elective admissions: numbers 11, 12, and 13; and for emergency admission: numbers 21, 22, 23, 24).

Patients identified as having surgery within the 11-year period were followed up until March 2012 using HES patient ID (HESID) to investigate any who had undergone further rectal prolapse operations (as a surrogate for recurrence). The HESID is a unique identifier for every patient that is calculated using NHS number, local hospital number and date of birth. Using HESID permitted follow-up of patients across time and place and was used to calculate reoperation rates for each surgical operation type. In addition, Consultant caseload was identified by searching all patients who underwent surgery by a specific consultant per year. The "Pconsult" code is a pseudo-anonymised code for each consultant, based on their GMC number, that permitted identification of individual caseloads. Similarly, hospital surgical volumes were calculated by searching the "SiteTreat" field.

Data analysis

Data have been presented descriptively with summary statistics based on data distribution. Population statistics were derived from Office of National Statistics census 2011 [16] to allow incidence rates per 100,000 population to be calculated for both rectal prolapse admission and rectal prolapse surgery. Limited statistical analyses were performed for time trends using regression of moving averages. All analyses were performed using SPSS version 18·0 (SPSS, Inc., Chicago IL).

Results

Tables 1 and 2 [Figure 1] show the main results by year from 2001 to 2012 with 25,238 adult patients undergoing a total of 29,379 operations for rectal prolapse over this time period (mean 2,662 per annum). There were obvious upward trends ($P<0.001$ for both) in total numbers of patients admitted and of those undergoing surgery of any type for rectal prolapse over time.

The number of patients admitted to hospital with rectal prolapse in 2011 was 8,927 providing an annual incidence rate of 18.5 per 100,000 for this year; 2,808 underwent rectal prolapse surgery providing a statistic of 6.1 per 100,000 per year. For patients over the age of 75, these rates were much higher (106 per 100,000 and 31 per 100,000 per year respectively). Over the same time period, population statistics showed the English population increased by about 3.9 million (8.0%) from around 49.1 million in 2001 to 53 million in 2011[17]. The number of people over the age of 65 years increased by 851,000 (10.9%) for England over the same period. Nevertheless, patient age at surgery remained remarkably constant (median 73 years) over the same period.

The number of operations performed per year increased by approximately one third from 2,320 in 2001 to 3,253 in 2011. The number of surgeons providing rectal surgery for prolapse increased from 384 in 2001 to 533 surgeons in 2011/2012 keeping the median number of operations performed by individual consultants relatively static at only 4 (IQR 2-7) per year. The number of hospitals providing rectal prolapse surgery increased marginally from 195 in 2001 to 222 in 2011 with a median increase in number of operations/hospital/per year from 8 (IQR 5-13) to 11 (IQR 5-17) in the final year of data analysis. Females were more than six times more likely to undergo surgery for rectal prolapse compared with males, with some operations having a very high female predominance compared to others (Table 2). Median length of stay (LOS) was 3 days (IQR 1-7). Overall, in-hospital mortality rate was 0.9%. Just over 10% of the operations (2,692/25,238 patients, 3,063/29,379 operations) were performed as an emergency.

Over the 11-year study period, perineal fixation remained the most popular surgical approach for both elective and emergency rectal prolapse repair [Table 2, Figure 2]. However, the number of patients undergoing laparoscopic surgery (repair/resection) increased more than 15-fold from only 48 (2.1% of total cases) in 2001/02 to 725 operations (22.3% of total) in 2011/12. Over the whole time period, patients selected for laparoscopic surgery were significantly younger than patients selected for other types of surgery with a median age of 67 years (IQR 52-79) [Figure 3]. In contrast, older patients were more likely to be offered perineal resection: median age 81 years (IQR 73-86). In the final year of data analysis, the median age for laparoscopic surgery was 65 years (IQR 50-78).

Elective surgery for rectal prolapse was associated with a significant shorter hospital LOS as compared with emergency surgery for all types of surgical repair [table 2]. Laparoscopic and perineal fixations were associated with the shortest hospital stay. Elective surgery was also associated with a significantly lower mortality rate (0.5%) compared with emergency surgery (2.5%). Patients who underwent open resection were at a higher risk of death compared with other types of surgical repair, with a mortality of 14.7% in the emergency setting and 3.4% in the elective setting. Elective laparoscopic and perineal fixations were associated with the lowest mortality of just 0.3%.

Using HESID-derived data, 3,241 (12.8%) patient underwent reoperation for rectal prolapse. The majority (2622; 80.9%) underwent one further surgical procedure; 489 (15.1%) underwent two further operations and a small proportion (n = 99; 3.1%) underwent three or more further operations. Operation type influenced reoperation rate [Table 2] with open resection rectopexy having the lowest reoperation rate (9.1% elective and 4.3% emergency) compared with higher rates for perineal resection (16.9% elective and 13.7% emergency) and open fixation (16.3% elective and 14.3% emergency). Laparoscopic fixation had an intermediate outcome in terms of re-operation (10.4% elective and 13.3% emergency).

Discussion

To our knowledge we present the largest dataset to date of patients undergoing surgery for rectal prolapse, with over 25,000 patients included. Several of the findings merit discussion: (1) the incidence of rectal prolapse and surgical repair increased year on year between 2001 and 2012 at a rate greater than that anticipated by population growth alone; (2) there appears to be little evidence of subspecialisation for rectal prolapse surgery with unchanged and low numbers of operations per surgeon per annum; (3) laparoscopic fixation has increased dramatically in popularity over the period and this operation has favourable outcomes in terms of LOS, mortality and reoperation compared with several other operations; (4) there is no compelling evidence of superiority of abdominal operations over perineal in general; and (5) data confirm the previous assertion of higher risk but lower reoperation (recurrence) rate after resection rectopexy[18].

The reported incidence of rectal prolapse in our study was 18.5 per 100,000 per year which is much higher than a previous report of only 2.5 per 100,000 in a Finnish population[19]. The overall in-hospital mortality rate for all types of surgery was less than 1% which is comparable to the reported mortality in the literature 0 – 6.5% [20-23]. Reported recurrence rates in the literature vary from 3- 33% [23-26] depending on the type of surgical repair and length of follow up. Our overall reoperation rate was approximately 12% for both elective and emergency cases.

There are several limitations to this study. The study used the HES database which contains administrative data reliant on the accuracy of clinical coding. A recent systematic review shows coding accuracy is improving and following the introduction of payment by results in 2002 the accuracy of coding for primary diagnoses has improved from 73.8% (IQR: 59.3-92.1%) to 96.0% (IQR: 89.3-96.3)[27]. It has been suggested that researchers should consider the context of conclusions that are drawn from HES data. If findings are of a general nature, then even a relatively high coding error rate at some, or all, hospitals will not detract markedly from the overall conclusions, particularly if significant deviation can be

shown[28, 29]. Thus, studies based on HES data may actually be appropriate for dealing with research questions such as those posed in this study although less good at identifying variations in care between individual trusts or clinicians[29]. Notably, we were unable to distinguish between patients with external and internal prolapse. There is no HES diagnostic code for internal prolapse and thus a minority of the cohort would be expected to represent patients with obstructed defection syndrome and high grade internal prolapse. Some specific procedure codes may point to such patients in the current cohort e.g. Per-anal resection of rectum using staples (H412) but only 201 patients (<1% cohort) underwent this procedure. Others, e.g. laparoscopic mesh fixation, have been applied to internal and external prolapse [30, 31] but it was not possible in the current cohort to determine how many patients had internal prolapse (hindered further by there being no code for anterior fixation with mesh). We elected to avoid any attempt to dissect data on this basis (hence we describe 'rectal prolapse' rather than 'external rectal prolapse' throughout). Another limitation of this study was the use of reoperation rate rather than actual recurrence rate. Thus, some patients who had a recurrence, but declined (or were unfit) for further repair, will not have been included in the analysis. This indicates that recurrence rates might be higher than the figures provided by these data. Finally, we acknowledge the time expiration on the data presented (only up to 2012). While sometimes it is normal for HES data to be presented several years after initial entry[32, 33], our data are now 7 years old. We do however feel that these still have value in understanding trends in surgical strategy, lack of subspecialisation / centralisation to at least this point in time. It provides surrogate outcomes on much larger numbers of patients than for instance widely cited single centre cohort studies and an under-recruited trial from the same time period[4].

In summary, this population-based cohort study demonstrates an increasing trend in both numbers of admissions and operations for rectal prolapse over the studied decade. Despite there being little or no evidence of service centralisation, there has been a significant change to laparoscopic fixation during this period and this operation appears safe with acceptable reoperation rates.

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Table 1: Trends in numbers of admissions and operations for rectal prolapse 2001-2012

Year	Total admissions	Total pts undergoing surgery	Total operations	Total surgeons	Operations/ surgeon: median (IQR)	Total hospitals	Operations / hospital: median (IQR)	Age: median (IQR)
01/02	4,950	2,230	2,320	384	4 (3-7)	195	8 (5-13)	73 (58-82)
02/03	5,135	2,085	2,352	391	4 (2-6)	185	8 (4-13)	73 (57-82)
03/04	5,322	2,102	2,404	408	4 (3-6)	200	8 (5-12)	73 (58-82)
04/05	5,389	1,988	2,321	417	4 (2-6)	197	9 (5-14)	73 (59-81)
05/06	5,763	2,060	2,451	432	4 (3-6)	212	10 (6-13)	73 (59-82)
06/07	6,058	2,162	2,543	461	4 (3-6)	186	9 (5-14)	74 (61-84)
07/08	6,411	2,251	2,612	487	4 (2-6)	192	10 (6-15)	73 (59-82)
08/09	6,838	2,404	2,798	483	4 (2-6)	191	10 (5-15)	73 (59-81)
09/10	7,685	2,532	3,031	518	4 (3-6)	200	11 (6-17)	73 (58-83)
10/11	8,371	2,616	3,159	521	4 (2-7)	222	11 (5-16)	73 (58-83)
11/12	8,927	2,808	3,293	533	4 (2-7)	222	11 (5-17)	73 (58-83)

Table 2: Data by type of operation for whole time period

a. elective operations

Type of repair	**Total patients**	**Total operations**	**Age: median (IQR)**	**Ratio: M: F**	**LOS: days median (IQR)**	**Total deaths (%)**	**Total reoperation (%)**	**% change total operations 2001 to 2012**
Open fixation	7,838	7,919	78 (68-85)	1:14.0	4 (2-7)	49 (0.6)	1279 (16.3)	+ 9%
Open resection	774	886	75 (58-82)	1:9.4	7 (4-11)	15 (1.9)	70 (9.1)	+ 56%
Lap fixation	2,303	2,780	65 (50-77)	1:12.8	3 (2-4)	7 (0.3)	244 (10.4)	+ 1,624%
Lap resection	179	248	67 (51-77)	1:14.3	6 (4-9)	1 (0.6)	19 (10.6%)	+ 660%
Perineal fixation	9,804	11,965	68 (54-79)	1:3.7	1 (0-4)	26 (0.3)	979 (9.9)	+ 4%
Perineal resection	1,548	2,322	80 (72-85)	1:14.6	4 (2-6)	10 (0.7)	262 (16.9)	+ 170%
Total all operations	**22,446**	**26,120**	**72 (57-82)**	**1:6.3**	**3 (1-5)**	**109 (0.5)**	**2853 (12.7)**	**+ 44%**

b. emergency operations

Type of repair	**Total patients**	**Total operations**	**Age: median (IQR)**	**Ratio: M:F**	**LOS: days median (IQR)**	**Total deaths (%)**	**Total reoperation (%)**	**% change total operations 2001 to 2012**
Open fixation	1,023	1,093	84 (79-87)	1:16.5	14 (8-22)	26 (2.5)	146 (14.3)	-13%
Open resection	164	164	82 (75-88)	1:6.4	15 (9-28)	23 (14.0)	7 (4.3)	+ 50%
Lap fixation	113	132	81 (77-85)	1:37	11 (6-22)	4 (3.5)	15 (13.3)	+ 1,250%
Lap resection	3	7	706 (64-92)	All female	29 (16-31)	0 (0)	1 (33.3)	+100%
Perineal fixation	1,198	1,344	82 (75-88)	1:7.2	13 (5-21)	24 (2.0)	129 (10.7)	-25%
Perineal resection	291	424	84 (82-86)	1:28.5	12 (8-21)	12 (4.1)	40 (13.7)	+ 189%
Total all operations	**2,792**	**3,164**	**83 (77-83)**	**1:11.9**	**13** (7-23)	**89 (3.2)**	**338 (12.1)**	**+ 4%**

Figure 1: Trend of total number of admission of rectal prolapse and patients underwent surgery and total number of procedure per year.

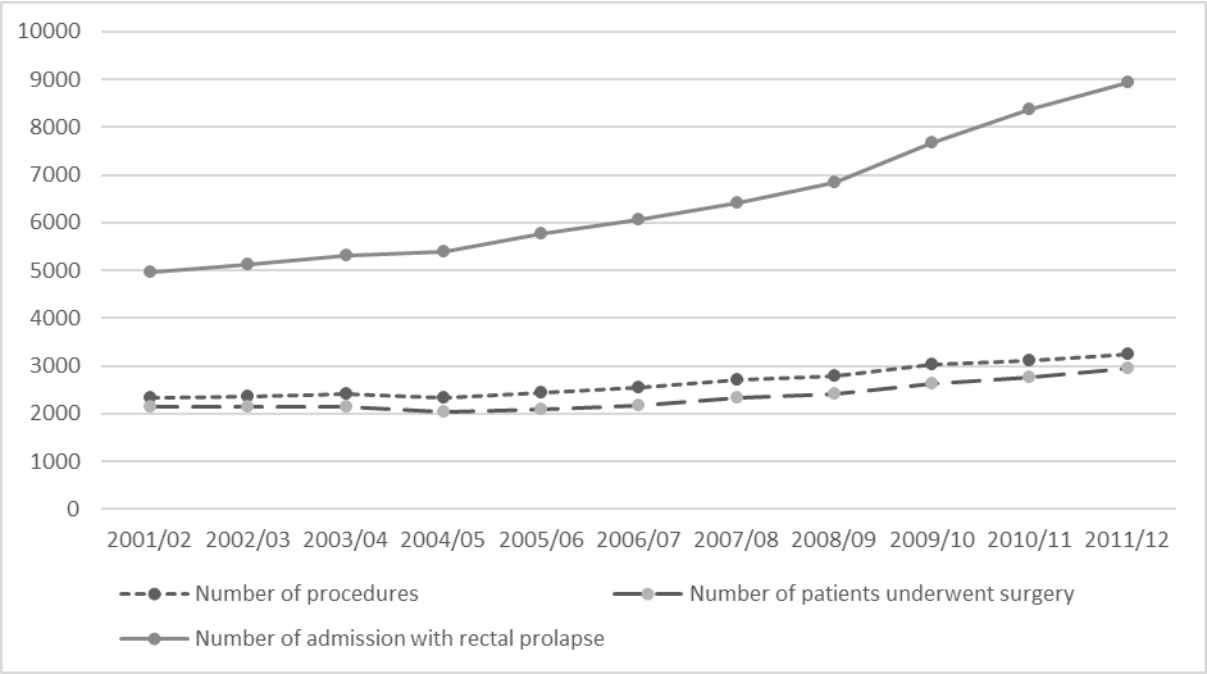


Figure 2: Trend of surgical procedures for rectal prolapse

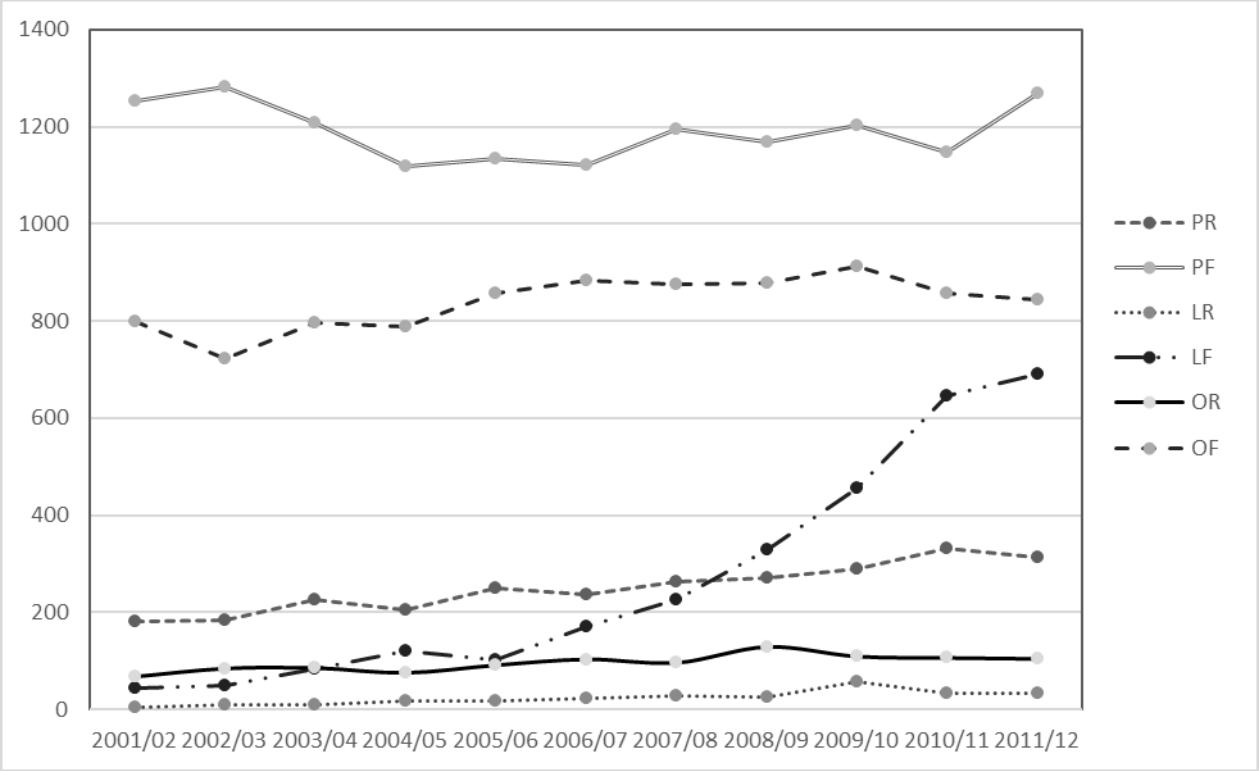
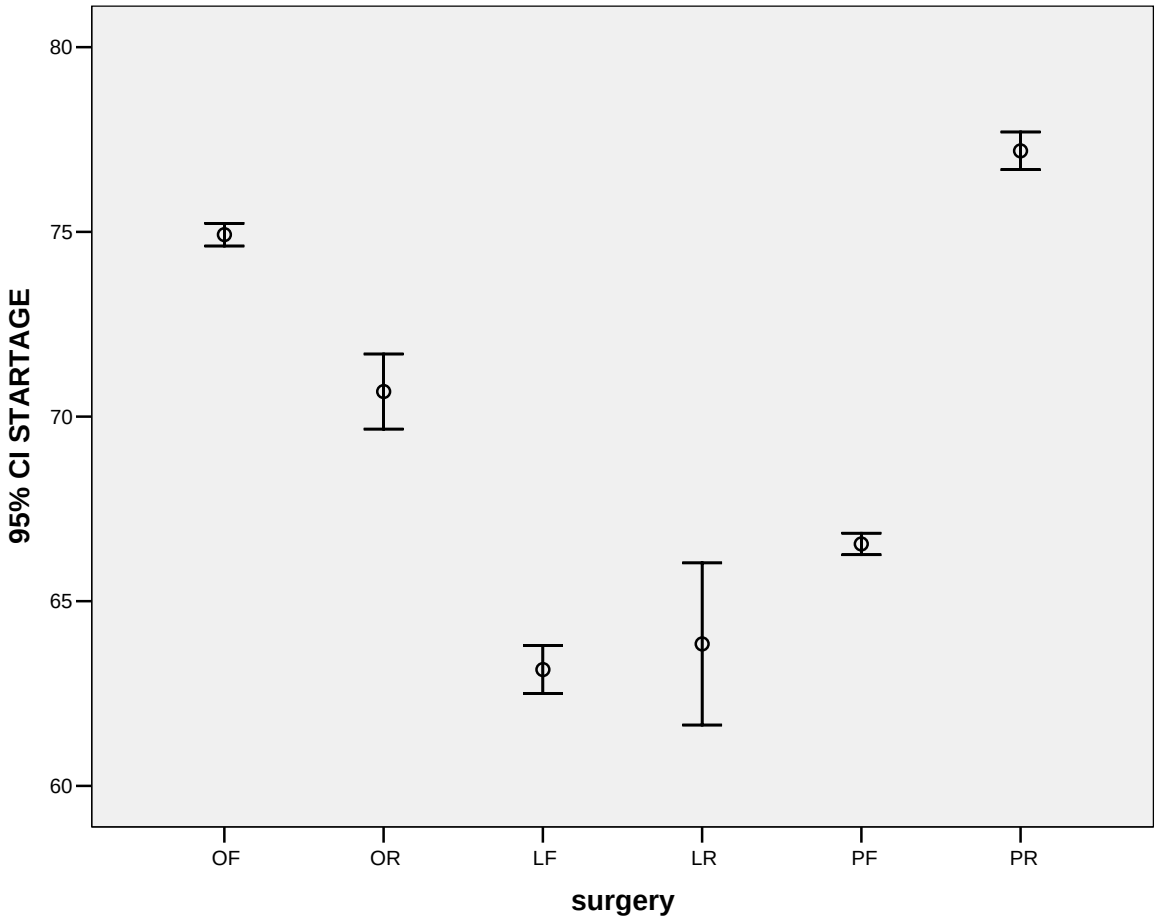


Figure 3: Median and interquartile range for surgical repair age



Supplementary table 1: Operative codes for surgery (OPCS4)

Open fixation	H351	Anterior fixation of rectum
	H352	Posterior fixation of rectum using prosthetic material
	H353	Posterior fixation of rectum NEC
	H354	Fixation of rectum using fascia lata
	H358	Other specified fixation of rectum for prolapse
	H359	Unspecified fixation of rectum for prolapse
	H361	Abdominal repair of levator ani muscles
	H368	Other specified abdominal operations for prolapse of rectum
	H369	Unspecified other abdominal operations for prolapse of rectum
Open resection	H04	Panproctocolectomy
	H05	Total Colectomy
	H09	Left Hemicolectomy
	H10	Sigmoid colectomy
	H29	Subtotal colectomy
	H33 Except H337	Anterior resection or proctectomy or Hartmann's Perineal resection of rectum
Laparoscopic surgery	Y75	Laparoscopic or robotic approach to abdominal cavity
	Y508	Laparoscopic or robotic approach to abdominal cavity
Conversion codes	Y714	Failed minimal access surgery
	Y718	Failed Minimal access surgery prior to 2007
Perineal fixation	H421	Insertion of encircling suture around perianal sphincter
	H422	Perineal plication of levator ani muscles and anal sphincters
	H423	Insertion of supralevator sling
	H425	Excision of mucosal prolapse of rectum NEC
	H426	Perineal repair of prolapse of rectum NEC
	H428	Other specified perineal operations for prolapse of rectum
	H429	Unspecified perineal operations for prolapse of rectum
	H414	Peranal mucosal proctectomy and endoanal anastomosis
Perineal resection	H337	Perineal resection of rectum
	H411	Rectosigmoidectomy and peranal anastomosis
	H412 &Y263	Peranal resection of rectum using staples