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Rates of Colpopexy and Colporrhaphy at the time of Hysterectomy for Prolapse

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Abstract

Background—It has been shown that addressing apical support at the time of hysterectomy for POP reduces recurrence and reoperation rates. In fact, national guidelines consider hysterectomy alone to be inadequate treatment for POP. Despite this, anterior and posterior colporrhaphy are frequently performed without a colpopexy procedure and hysterectomy alone is often utilized for treatment of prolapse.

Objectives—The objectives of this study were to: 1) determine rates of concomitant procedures for pelvic organ prolapse (POP) in hysterectomies performed with POP as an indication, 2) identify factors associated with performance of a colpopexy at the time of hysterectomy for POP, and 3) identify the influence of surgical complexity on perioperative complication rates.

Study Design—This is a retrospective cohort study of hysterectomies performed for POP from January 1, 2013 to May 7, 2014 in a statewide surgical quality database. Patients were stratified based on procedures performed: hysterectomy alone, hysterectomy with colporrhaphy and without apical suspension, and hysterectomy with colpopexy with or without colporrhaphy. Demographics, medical history and intraoperative care, and perioperative care were compared between the groups. Multivariable logistic regression models were created to identify factors independently associated with use of colpopexy and factors associated with increased rates of postoperative complications.

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Conflicts of Interest:

The authors report no conflict of interest.

Results—POP was an indication in 1557 hysterectomies. Most hysterectomies were vaginal (59.6%), followed by laparoscopic or robotic (34.1%), and abdominal (6.2%). Hysterectomy alone was performed in 43.1% (95% CI 40.6–45.6) of cases, 32.8% (95% CI 30.4–35.1) had a colporrhaphy without colpopexy, and 24.1% (95% CI 22–26.3) had a colpopexy with or without colporrhaphy. Use of colpopexy was independently associated with patient age over 40, POP as the only indication for surgery (OR 1.6, 95% CI 1.185–2.230), laparoscopic surgery (OR 3.2, 95% CI 2.860–5.153), and a surgeon specializing in urogynecology (OR 8.2, 95% CI 5.156–12.923). The overall perioperative complication rate was 6.6%, with the majority being considered minor. Complications were more likely when the procedure was performed with an abdominal approach (OR 2.3, 95% CI 1.088–4.686), with the use of a colpopexy procedure (OR 3.1, 95% CI 1.840–5.194), and by a surgeon specializing in urogynecology (OR 2.2, 95% CI 1.144–4.315).

Conclusions—Colpopexy and colporrhaphy may be underutilized and are potential targets for quality improvement. Performance of additional procedures at the time of hysterectomy increased the rate of perioperative complications. Long-term consequences of these surgical practices deserve additional study.

Keywords

apical suspension; colpopexy; colporrhaphy; pelvic organ prolapse; surgical quality measures

Introduction

Hysterectomy is the second most common surgical procedure performed on women in the United States¹. Pelvic organ prolapse (POP) is the most common indication for hysterectomy in postmenopausal women², and is the indication for 14% of hysterectomies in the United States³.

The role of hysterectomy in the treatment of prolapse is controversial and is an area of active investigation. However, it has been shown that addressing apical support at the time of hysterectomy for POP reduces recurrence and reoperation rates⁴. In fact, national guidelines consider hysterectomy alone to be inadequate treatment for POP⁵. Despite this, anterior and posterior colporrhaphy are frequently performed without a colpopexy procedure^{4,6} and hysterectomy alone is often utilized for treatment of prolapse⁷.

Our primary objectives were to describe how often concomitant prolapse procedures are used at the time of hysterectomy for POP, to identify those factors associated with use of colporrhaphy and colpopexy (apical suspension) at the time of hysterectomy for POP, and to identify the influence of surgical complexity on perioperative complication rates.

Materials and Methods

This is a retrospective analysis of hysterectomies from the Michigan Surgical Quality Collaborative (MSQC). Funded by the Blue Cross Blue Shield of Michigan/Blue Care Network, MSQC consists of 52 hospitals voluntarily collecting perioperative surgical data on a sample of patients, irrespective of a patient's insurance, for general surgery, vascular surgery, and hysterectomy cases. This represents 30.2% of hospitals in Michigan. Of these

hospitals, 19.2% have 500 beds and 53.9% are teaching institutions. Hysterectomy-specific data collection began in January 2013. Data collection occurs on a rotating schedule of different days of the week. The first 25 cases meeting the CPT code inclusion criteria at each participating institution during consecutive 8-day cycles throughout the year are selected. Cases are followed for 30 days postoperatively to capture readmissions and complications. Dedicated registered nurses trained in data abstraction collect data from hospital records. Provider speciality is identified by the nurse abstractor at the hospital where the surgery was performed based on personal knowledge of the physicians' practice. The data collection is standardized and regularly reviewed through site visits, conference calls, and internal audits.

We reviewed hysterectomies in the database performed from January 1, 2013 through May 7, 2014. The data presented represent all hysterectomy-specific data available at the time of analysis. Inclusion criteria were age greater than 18 years and a preoperative indication of POP in the operative report. Route of hysterectomy was determined with operative note review. Total and subtotal hysterectomies were grouped together based on surgical approach. Robotic-assisted laparoscopic and laparoscopic hysterectomies were both included as laparoscopic approach. Vaginal and laparoscopic-assisted vaginal hysterectomies were considered vaginal approach. Concomitant procedures were determined with Current Procedural Terminology (CPT) codes. CPT codes indicating use of colporrhaphy were the following: 57240 (anterior), 45560 or 57250 (posterior), and 57260 or 57265 (combined anterior and posterior). CPT codes indicating use of colpexy or apical suspension were the following: 57425 (laparoscopic), 57280 (abdominal), 57282 (extraperitoneal), and 57425 (intraperitoneal). Subjects were stratified based on surgical intervention into three cohorts. In the first group are "hysterectomy only" cases, in which there were no CPT codes for either colporrhaphy or colpexy. In the second group are "hysterectomy with colporrhaphy" cases, in which CPT codes for colporrhaphy are present but CPT codes for colpexy are not. In the third group are "hysterectomy with colpexy" cases, in which CPT codes for colpexy are present and those for colporrhaphy may or may not be present. Perioperative complications were identified by chart review. Data abstracters reviewed the patient chart using predetermined definitions to identify the various complications. For example, urinary tract infection was identified when the patient reported symptoms of urinary tract infection in conjunction with a positive urinalysis and/or urine culture. Complications were then classified as either "major" or "minor." Major complications included deep incisional surgical site infection (SSI), organ/space SSI, pneumonia, unplanned intubation, pulmonary embolism, acute renal failure/insufficiency, stroke, cardiac arrest, myocardial infarction, cardiac arrhythmia, transfusion, deep vein thrombosis, sepsis, clostridium difficile infection, and central line-associated bloodstream infection. Urinary tract infection (UTI) and superficial SSI were considered minor complications. Conversion from planned surgical route was not considered a complication. The Institutional Review Board (IRB) at the University of Michigan deemed analyses regarding this dataset to be exempt from formal IRB approval (HUM00073978).

Bivariate analyses were used to compare the three patient groups stratified by surgical procedures and to identify variables for the multivariate analyses. Categorical variables were compared with chi-square statistics and ANOVA with Welch adjustment for normally distributed, continuous variables. Non-normally distributed variables were analyzed with

nonparametric Kruskal-Wallis Test. Clinically relevant factors also statistically significant in bivariate analysis ($P < 0.05$) were entered into a stepwise multivariable logistic regression algorithm. The outcome variables of interest were 1) use of colpopexy and 2) any perioperative complication. Variables were evaluated for collinearity through correlation analyses. Final models included only significant variables. Model fit was assessed with Hosmer-Lemeshow chi-square tests and C-statistics (shown at the bottom of tables). Analyses were performed using SPSS Version 21.0 (Armonk, NY: IBM Corp) and SAS Version 9.3 (Cary, NC: SAS Institute).

Results

Among 9860 hysterectomies in the MSQC, POP was listed as a pre-operative indication for 1557 (15.8%) and as the only indication for 878 (8.9%). The indication for surgery was missing for 49 (0.5%). The mean age of women was 56.7 $\pm$ 12.9 years, the mean body mass index (BMI) was 28.9 $\pm$ 6 kg/m², and the majority of women were white (1369, 87.9%). Physicians identified as obstetrician-gynecologists performed 90.2% of the hysterectomies for prolapse, urogynecologists performed 7.8%, and the remaining 2% were performed by gynecologic oncologists and/or general surgeons. When prolapse was an indication, the most common route of hysterectomy was vaginal or laparoscopic-assisted vaginal (59.6%). Of the remaining cases, 34.1% were robotic-assisted laparoscopic or laparoscopic, and 6.2% were abdominal.

Figure 1 displays procedures performed at the time of hysterectomy for POP. In 43.1% (95% CI 40.6–45.6) of cases, POP was treated with hysterectomy alone. Hysterectomy with colporrhaphy but without colpopexy was performed in 32.8% (95% CI 30.4–35.1). There were 376 colpopexies (24.1%, 95% CI 22–26.3) performed. Of these, 79 (21%) were extraperitoneal colpopexies, 136 (36.2%) were intraperitoneal colpopexies, and 161 (42.8) were sacral colpopexies. Generalist obstetrician-gynecologists performed a colpopexy in 289 (25.1%) of their cases with POP. In comparison, urogynecologists performed a colpopexy in 87 (71.9%) of their cases. Patients of urogynecologists were older than those of other providers (60.1 versus 56.4 years, $p = 0.03$), more likely to have POP as the sole indication for their hysterectomy (68.6% versus 55.4%, $p = 0.003$), and more likely to have an ASA class 3 or greater (31.4% versus 19.9%, $p = 0.003$), but were no more likely to have prior pelvic surgery (40.5% versus 46.7%, $p = 0.113$) or abdominal surgery (34.6% versus 36.8%, $p = 0.39$).

Comparisons of demographic and perioperative characteristics associated with the three cohorts are shown in Table 1. Women having hysterectomy alone were younger, had higher BMI, were more likely to be non-white, had higher prevalence of other indications (in addition to POP) for hysterectomy, had lower prevalence of ASA class 3 or greater, had lower prevalence of medicare insurance, and had higher prevalence of prior pelvic surgery. Of the 878 women who had POP as the sole indication for hysterectomy, 290 (33%) had hysterectomy without concomitant procedures and 246 (28%) had a colpopexy. Women who had colporrhaphy at the time of hysterectomy without colpopexy had higher prevalence of vaginal hysterectomy. Those who had colpopexy performed were more likely to have had their procedure done by a urogynecologist, had higher utilization of laparoscopic approach,

and had higher rates of concomitant incontinence sling. Compared to other practitioners, urogynecologists were more likely to perform a concomitant sling (10.6% versus 49.6%, $P < .0001$) and more likely to perform colpopexy (20.1% versus 71.9%, $P < .0001$). However, urogynecologists were not more likely to report adhesions adding to operative complexity (3.3% versus 2.5%, $P = 0.6$) or perform concomitant salpingoophorectomy (79.5% versus 80.2%, $P = 0.9$).

The multivariable regression model with colpopexy as the outcome of interest is presented in Table 2. Candidate factors entered were age by decile, BMI, non-white race, prior pelvic surgery, urogynecology subspecialist, insurance status, surgical indication, and surgical approach. The model was also controlled for hospital bed size. After these factors were controlled for, age older than 49 years, POP being the sole indication for surgery, use of laparoscopy versus vaginal approach, and a surgeon specializing in urogynecology were independently associated with colpopexy.

The overall complication rate was 6.6%. The rates of major and minor complications were 1.9% and 4.9%, respectively. Postoperative urinary tract infection was the most common complication, affecting 2.8% ($n = 43$). Postoperative blood transfusions were reported in 1% ($n = 17$). Complications occurring in less than 1% of cases included superficial surgical site infection ($n = 6$), organ or space infection ($n = 6$), pulmonary embolism ($n = 3$), unplanned intubation ($n = 3$), acute renal insufficiency ($n = 2$), myocardial infarction ($n = 1$), cardiac arrhythmia ($n = 2$), deep vein thrombosis ($n = 2$), and sepsis ($n = 5$). Within the 30-day post operative period, there were 48 (3.1%) readmissions, 49 (3.1%) reoperations, and 117 (7.5%) emergency department evaluations.

Comparisons of complication rates between groups stratified by surgical procedures are presented in Table 3. We created a multivariable model to predict any perioperative complication (intraoperative and postoperative adverse events, as well as 30-day readmission or reoperation). In the model, performance of colpopexy, urogynecology subspecialist provider, and abdominal surgical approach were associated with increased odds of complication (Table 4). Laparoscopic approach was associated with an increased complication rate when compared to the vaginal approach. Given the unexpected findings that vaginal approach and surgery performed by urogynecologist being associated with an increased complication rate we created a second model looking at any complication other than UTI. Once UTI is excluded, the complication rate of urogynecologists compared to other providers is no longer significant (OR 0.915, 95% CI 0.257–3.263). In addition, laparoscopic approach compared to vaginal approach no longer had a protective effect (OR 1.119, 95% CI 0.5–2.509). Hosmer and Lemeshow test with 7 groups was 0.633 and C statistic was 0.633. Due to the rarity of major perioperative complications, it was not feasible to create a model looking at these more serious adverse events.

Comment

In this study, we found evidence that prolapse procedures at the time of hysterectomy for pelvic organ prolapse were underutilized. One third of cases in which prolapse was the sole indication for surgery had no concomitant prolapse procedures performed. This number

increased to 43% when prolapse was one of several indications for surgery. While hysterectomy alone may be appropriate treatment for a small group of women, it is highly unlikely to be sufficient for a group this large. This cohort's long-term outcome is unknown, but with reported symptomatic recurrent prolapse rates of 20–25%^{8,9} and reoperation rates as high as 29%^{10,11}, it is important to evaluate what is happening in clinical practice.

The relationship between surgeon speciality and the likelihood of undergoing an colpopexy is worthy of comment. Colpopexy was utilized in 24% of cases and urogynecologists were vastly more likely to perform a colpopexy, consistent with prior work by Yurteri-Kaplan, et al¹². This is a finding that may reflect the training and experience of subspecialists. There is a learning curve in performing the dissections necessary for these procedures and in managing the risk of complications. The risks of ureteral and bladder injury with intraperitoneal colpopexy range from 1 to 5%¹³, while hemorrhage with extraperitoneal colpopexy or sacral colpopexy can be massive and life-threatening. These types of major injuries were extremely rare in our cohort, likely related to the concentration of these procedures in subspecialists' practices. Our data revealed that the increase in all complications for urogynecologists was related to urinary tract infections—an expected finding given the potential for voiding dysfunction when undertaking additional procedures for prolapse and urinary incontinence. Another unexpected finding was the increased complication rate for vaginal compared to laparoscopic procedures, but again, once UTI was excluded complications were similar between groups. The increased rate of UTI in the vaginal group could be related to increased tissue manipulation around the urethra. Major complications were similar among the groups. Like our study population, Kantartzis, et al. noted a statistically-significant higher rate of complications for procedures including colpopexy¹⁴.

The rate of colpopexy at the time of hysterectomy we found is consistent with previous reports in the literature. Eilber, et al. reported that 21–26% of hysterectomies for prolapse among Medicare beneficiaries included a colpopexy⁴. In contrast, Alas, et al.¹⁵ and Kantartzis, et al.¹⁴ both reviewed their experiences at a single center and reported that 48% and 55% hysterectomies for POP had concomitant apical procedures. These studies reflect the fact that rates of colpopexy will vary remarkably among hospitals and that subspecialty training is associated with higher rates of utilization.

Another independent predictor of colpopexy was increasing age. This finding is in agreement with the Kantartzis study, which found that women older than 75 were more likely to have a colpopexy¹⁴. In our population, older women were also more likely to have surgery with a urogynecology subspecialist. The higher rates of colpopexy among women treated by subspecialists in urogynecology could reflect referral bias, either for more advanced POP or perhaps for increased medical complexity as indicated by the higher proportion of women having ASA class 3 or greater. This finding is particularly interesting given the general concern that younger women are likely at increased risk for symptomatic recurrence and may be the group which would benefit most from appropriate colporrhaphy and colpopexy.

There are several considerations when assessing this study's findings. A major strength is the large size of the dataset with dedicated chart abstraction and a formal auditing process to ensure data accuracy. These findings reflect a variety of practices in community and academic centers, making the data more generalizable even though the data is from only one state. It should be noted that the current MSQC sampling methodology is un-weighted and does not directly support estimation of hysterectomy rates of the target population or total case volume for the target population at a hospital. With these limitations in mind, hospital bed size was included in the multivariable analysis to account for this potential site variation, we included hospital bed size in the multivariable analysis. The lack of data on severity of POP is also a limitation. For instance, we do not know if urogynecologists were referred more severe cases of prolapse, leading to a higher rate of colpopexy, or whether they were more likely to perform a procedure due to their subspecialty training. Furthermore, though it is widely accepted that hysterectomy alone is not adequate treatment for prolapse, we do not have long-term outcome data for this cohort and cannot determine if women who had hysterectomy alone truly had higher failure rates. Another limitation is the identification of provider specialty, which is based on the provider's proclaimed specialty status and not board certification status. It is possible that some providers are misclassified; however, their classification reflects their reputation within the community since the nurse abstractors are employed by the hospital and familiar with local practice patterns. A further limitation is the potential for missing data in our complication analysis. It is possible that some patients sought care for perioperative complications outside of hospitals in the MSQC system. These complications were not captured by the data abstractors and complication rates may be higher than reported.

This study provides information about current practice patterns in prolapse care in a diverse patient/physician population. While the American Congress of Obstetricians and Gynecologists (ACOG) expressly states that hysterectomy alone is not acceptable treatment for prolapse, 43.1% did not have either colporrhaphy or colpopexy to address pelvic floor laxity. While there are no outcome data for this cohort, these women could be at increased risk for surgical failure and repeat surgery. It is also important to note that while additional surgery may be indicated for many women with POP, it may come at the cost of increased minor perioperative complications. In this analysis, we did not find any significant increase in major complications. Ultimately, the relative risks and benefits of additional surgery and recurrent prolapse should be considered carefully based on particular patient characteristics—most importantly, patient goals and specifics of their disease state. In order to best determine how to treat and counsel women with prolapse, data on recurrence with and without colporrhaphy and with and without colpopexy are needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Procedures Performed at the Time of Hysterectomy for POP

Figure 1 displays the number and percentage of women having additional prolapse-directed procedures at the time of hysterectomy for pelvic organ prolapse. Numbers in colored bars represent n for each group and percentage of all hysterectomies performed for pelvic organ prolapse in the MSQC database.

POP: pelvic organ prolapse

Figure 2. Perioperative Complications Associated with Procedures Performed at the Time of Hysterectomy for Prolapse

Figure 2 displays percentage of women having perioperative complications at the time of their hysterectomy for prolapse based on types of procedures performed.

** P = 0.003, *** P = <.0001, all other P >0.05

Table 1

Factors Associated with Surgery Performed for POP

	Hysterectomy Only N = 671	Hysterectomy with Colporrhaphy N = 510	Hysterectomy with Colpopexy +/- colporrhaphy N = 376	p value (ANOVA or Chi-square)
Age (years)	53.2 ± 13	59.6 ± 12.3	59 ± 12.2	<.0001
BMI (kg/m ²)	29.4 ± 6.3	28.4 ± 5.6	28.6 ± 12.9	0.021
Parity	2 [2, 3]	2 [2, 3]	2 [2, 3]	0.67
Non-white race	102 (15.2)	50 (9.8)	36 (9.6)	0.004
ASA class 3-4	122 (18.2)	109 (21.4)	93 (24.7)	0.04
Insurance				<.00001
Medicaid	49 (7.3)	23 (4.5)	8 (2.1)	
Medicare	139 (20.7)	179 (35.1)	111 (29.5)	
Medicaid & Medicare	7 (1)	10 (2)	8 (2.1)	
Private Insurance	445 (66.3)	284 (55.7)	213 (56.6)	
Uninsured	11 (1.6)	3 (0.6)	3 (0.8)	
Other	20 (3)	11 (2.2)	33 (8.8)	
Prior pelvic surgery	334 (49.8)	218 (42.7)	167 (44.4)	0.04
Sole indication POP	290 (43.2)	342 (67.1)	246 (65.4)	<.0001
Other indications				
AUB/Leiomyomas	274 (40.8)	106 (20.8)	74 (19.7)	<.0001
Chronic Pain/Endometriosis	188 (28)	74 (14.5)	66 (17.6)	<.0001
Other	84 (12.5)	37 (7.3)	30 (8)	0.004
Surgical approach				<.0001
Laparoscopic	239 (35.6)	94 (18.4)	198 (52.7)	

	Hysterectomy Only N = 671	Hysterectomy with Colporrhaphy N = 510	Hysterectomy with Colpopexy +/- colporrhaphy N = 376	p value (ANOVA or Chi- square)
Abdominal	74 (11)	9 (1.8)	14 (3.7)	
Vaginal	358 (53.2)	406 (79.6)	164 (43.6)	
Concomitant sling	41 (6.1)	56 (11)	115 (30.6)	<.0001
Oophorectomy	523 (77.9)	406 (79.6)	310 (82.4)	0.2
Specimen Weight	87 [54, 128.5]	64.5 [44, 97]	67 [45.4, 108]	<.0001 [/]
Severe Adhesions	25 (3.7)	11 (2.2)	14 (3.7)	0.3
Surgical Time (hrs)	2.1 ± 1.2	2.1 ± 0.9	2.7 ± 1.2	<.0001 [/]
Urogynecologist	25 (3.7)	9 (1.8)	87 (23.1)	<.0001

Data presented as Mean ± Standard Deviation, n (%) or median [interquartile range]

[/] Welch adjustment for non-normal distribution

BMI: body mass index; POP: pelvic organ prolapse; AUB: abnormal uterine bleeding

Table 2

Multivariable Model of Factors Associated with Performance of a Colpopexy at Time of Hysterectomy^{1,2}

Variable	Crude Odds Ratio	Adjusted Odds Ratio	95% C.I.	Regression coefficient	Standard error	p value
Constant	-----	-----	-----	-3.2294	0.3245	<.0001
Hospital Size 500 beds Ref: <500 beds	1.8112	1.854	1.291–2.661	0.6172	0.1844	0.0008
Sole indication POP Ref: multiple indications including POP	1.6438	1.609	1.172–2.210	0.4759	0.1619	<.0001
Surgical Approach Ref: Vaginal						
Laparoscopic	3.164	4.350	3.197–5.92	1.4703	0.1572	<.0001
Abdominal	0.722	1.145	0.574–2.286	0.1354	0.3527	0.7
Age Ref: Age <40						
40–49	2.17	1.729	0.900–3.325	0.5478	0.3335	0.1
50–59	2.634	2.245	1.166–4.325	0.8089	0.3344	0.02
60–69	3.414	3.057	1.580–5.916	1.1175	0.3369	0.0009
70+	2.904	2.592	1.312–5.123	0.9525	0.3476	0.006
Urogynecologist Ref: all other surgeons	10.156	8.016	5.057–12.706	2.0814	0.2350	<.0001

Variables Entered: Age in Deciles, BMI, Non-white race, Prior Pelvic Surgery, Urogynecology Specialist, Hospital Size, Teaching Status of Institution, Insurance Status, Indication for Surgery, Surgical Approach

¹ Hosmer-Lemeshow Goodness of Fit Test = 0.8257, 9 groups

² C-Statistic = 0.752;

Table 3

Multivariable Model of Factors Associated with Any Perioperative Complication at Time of Hysterectomy for POP^{1,2}

Variable	Crude Odds Ratio	Adjusted Odds Ratio	95% C.I.	Regression coefficient	Standard error	p value
Constant	-----	-----	-----	-3.264	0.6157	<.0001
Surgical Approach Ref: Vaginal						
Laparoscopic	0.58	0.369	0.202–0.674	-0.9962	0.3069	0.001
Abdominal	2.018	2.148	1.022–4.512	0.7643	0.3788	0.04
Colpopexy Ref: No Colpopexy	2.944	2.909	1.720–4.922	1.0679	0.2683	<.0001
Urogynecologist Ref: All Other surgeons	3.136	2.088	1.071–4.073	0.7364	0.3409	0.03

Variables Entered: Age, Charlson Comorbidity Index, BMI, Concomitant Oophorectomy, Specimen Weight, Severe Adhesions, Surgical Time, Urogynecology Specialist, Surgical Approach, Performance of Apical Suspension

¹ Hosmer-Lemeshow Goodness of Fit Test = 0.695; 10 groups

² C-Statistic = 0.701