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Prevalence of Uterine Pathology in Women Undergoing Minimally Invasive Hysterectomy Employing Electric Power Morcellation

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Introduction

While minimally invasive surgery has improved outcomes for hysterectomy, the procedure requires removal of the uterus through small incisions. Morcellation, or fragmentation of the uterus into smaller pieces, is one method to remove the uterus. Recently, concern has been raised that morcellation may result in the spread of undetected malignancies.[1] Despite the commercial availability of electric power morcellators for 2 decades, accurate estimates of the prevalence of malignancy at the time of electric power morcellation (herein referred to as morcellation) are lacking,[1,2] with single-center studies reporting prevalences from 9 to 100 in 10,000.[3,4,] We used a large insurance database to investigate the prevalence of underlying cancer in women who underwent uterine morcellation.

Methods

The Perspective database was used to identify women who underwent a minimally invasive hysterectomy from 2006-2012. Perspective is an all-payer database including over 500 hospitals capturing 15% of hospitalizations. Hospitals within Perspective are more frequently urban, teaching centers and located in the southern United States. Data undergo a rigorous quality control process. Utilization of commercially available morcellators was captured by identification of charge codes.[5] The analysis was deemed exempt by the Institutional Review Board.

The primary outcome was identification of uterine corpus cancer (all histologies) based on ICD9 coding at surgery. We also examined the occurrence of uterine neoplasms of uncertain malignant potential; malignancies of other parts of the uterus, including cervical cancer, and surrounding adnexal structures (other gynecologic cancer); and endometrial hyperplasia.

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Multivariable mixed effects log-linear models including clinical and demographic covariates and a random-intercept for the procedural hospital were developed for uterine cancer and endometrial hyperplasia. The other outcomes were rare and the models did not converge. All statistical analyses were 2-sided and performed with SAS version 9.4. A P-value of <0.05 was considered statistically significant.

Results

Within the cohort of 232,882 women who underwent minimally invasive hysterectomy from 2006-2012, morcellation was performed in 36,470 (15.7%) (Table 1). Among those who underwent morcellation, 99 cases of uterine cancer were identified, a prevalence of 27 per 10,000 (95% CI, 22-32 per 10,000). Twenty-six cases of other gynecologic malignancies were found, a prevalence of 7 per 10,000 (95% CI, 4-10 per 10,000), 39 uterine neoplasms of uncertain malignant potential (11 per 10,000, 95% CI, 7-14 per 10,000), and 368 cases of endometrial hyperplasia (101 per 10,000, 95% CI, 91-111 per 10,000).

Among women who underwent morcellation, advanced age was associated with underlying cancer and endometrial hyperplasia (Table 2). Compared with women less than 40 years, the prevalence ratio for a uterine malignancy rose with age from 4.97 (95% CI, 1.91-12.93) in women 50-54 years, to 19.37 (95% CI, 7.66-48.95) in those age 55-59 years, 21.36 (95% CI, 7.22-63.21) in those age 60-64 years, and 35.97 (95% CI, 14.14-91.53) for women 65 years or older.

Discussion

Our data demonstrate that uterine cancers occurred in 27 per 10,000 women undergoing morcellation. Other malignancies and precancerous abnormalities were also detected. Although morcellators have been in use since 1993, few studies have described the prevalence of unexpected pathology at the time of hysterectomy.[2-4] Prevalence information is the first step in determining the risk of spreading cancer with morcellation. Although data are limited, women with apparent uterine-confined neoplasms at the time of morcellation have been found to have intraperitoneal tumor dissemination at the time of re-exploration.[3,6]

We recognize a number of limitations including the inability to verify pathologic findings, possible misclassification of pathology, potential undercapture of morcellation and the fact that our findings may not be generalizable to all hospitals. Last, we lack data on long-term follow-up, and the outcome of women with pathologic abnormalities who underwent morcellation requires further study. Patients considering morcellation should be adequately counseled about the prevalence of cancerous and precancerous conditions prior to undergoing the procedure.

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Dr. Wright had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1

Clinical and demographic characteristics of the cohort.

	Electric power morcellator		No electric power morcellator		
	N	**(%)**	**N**	**(%)**	***P-value***
	36,470	(15.7)	196,412	(84.3)	
Age (years)					<0.001
<40	9452	(25.9)	55,395	(28.2)	
40-44	9857	(27.0)	43,102	(21.9)	
45-49	9977	(27.4)	41,980	(21.4)	
50-54	4391	(12.0)	22,825	(11.6)	
55-59	1485	(4.1)	13,559	(6.9)	
60-64	512	(1.4)	6367	(3.2)	
≥65	796	(2.2)	13,184	(6.7)	
Year of diagnosis					<0.001
2006	2511	(6.9)	15,755	(8.0)	
2007	3726	(10.2)	18,470	(9.4)	
2008	4792	(13.1)	19,601	(10.0)	
2009	4905	(13.4)	25,765	(13.1)	
2010	5821	(16.0)	33,187	(16.9)	
2011	7327	(20.1)	40,742	(20.7)	
2012	7388	(20.3)	42,892	(21.8)	
Race					<0.001
White	23,301	(63.9)	140,822	(71.7)	
Black	5943	(16.3)	20,495	(10.4)	
Other	7226	(19.8)	35,095	(17.9)	
Marital status					<0.001
Married	20,853	(57.2)	116,929	(59.5)	
Single	10,700	(29.3)	57,984	(29.5)	
Unknown	4917	(13.5)	21,499	(10.9)	
Insurance status					<0.001
Commercial	30,390	(83.3)	147,340	(75.0)	
Medicare	1688	(4.6)	17,930	(9.1)	
Medicaid	2451	(6.7)	18,072	(9.2)	
Uninsured	724	(2.0)	5747	(2.9)	
Unknown	1217	(3.3)	7323	(3.7)	
Robotically assisted					<0.001
No	30,788	(84.4)	136,436	(69.5)	
Yes	5682	(15.6)	59,976	(30.5)	
Comorbidity (Elixhauser)					<0.001
0	15,893	(43.6)	74,349	(37.9)	
1	10,585	(29.0)	53,218	(27.1)	

	Electric power morcellator		No electric power morcellator		
	N	**(%)**	**N**	**(%)**	***P-value***
≥2	9992	(27.4)	68,845	(35.1)	
Area of residence					
Metropolitan	33,116	(90.8)	173,359	(88.3)	<0.001
Non-metropolitan	3354	(9.2)	23,053	(11.7)	
Region					<0.001
Northeast	4924	(13.5)	19,446	(9.9)	
Midwest	4570	(12.5)	41,151	(21.0)	
South	19,829	(54.4)	99,060	(50.4)	
West	7147	(19.6)	36,755	(18.7)	
Hospital teaching status					<0.001
Teaching	13,673	(37.5)	66,329	(33.8)	
Non-teaching	22,797	(62.5)	130,083	(66.2)	
Hospital bed size					0.03
<400	20,555	(56.4)	109,481	(55.7)	
400-600	9616	(26.4)	53,103	(27.0)	
>600	6299	(17.3)	33,828	(17.2)	
Hospital procedural volume (median)	38 (20-60)		42 (20-62)		<0.001

Data on race is based on self-report of patients with predefined racial categories. The classification for comorbidity is based on the Elixhauser index and includes major comorbid medical conditions. A score of 0 represents no conditions, 1 is 1 comorbid condition and ≥2 indicates 2 or greater medical comorbidities. Classification of area or residence is based on population density of the hospital area and is reported by hospitals.

Table 2

Multivariable models of variables associated with uterine cancer and endometrial hyperplasia among women who underwent morcellation.

	Uterine cancer		Endometrial hyperplasia	
	Prevalence ratio	**N**	**Prevalence ratio**	**N**
Age (years)				
<40	Referent	6	Referent	43
40-44	1.42 (0.51-4.01)	9	1.17 (0.78-1.76)	52
45-49	2.55 (1.00-6.51)*	17	1.71 (1.17-2.50)*	78
50-54	4.97 (1.91-12.93)*	15	4.07 (2.79-5.93)*	83
55-59	19.37 (7.66-48.95)*	20	8.22 (5.45-12.39)*	56
60-64	21.36 (7.22-63.21)*	8	9.38 (5.50-16.00)*	22
≥65	35.97 (14.14-91.53)*	24	10.21 (5.43-19.17)*	34
Year of diagnosis				
2006	Referent	5	Referent	18
2007	0.77 (0.23-2.58)	6	1.50 (0.84-2.65)	40
2008	1.30 (0.43-3.88)	12	1.30 (0.72-2.34)	44
2009	1.06 (0.34-3.31)	12	1.63 (0.89-3.01)	58
2010	1.61 (0.53-4.87)	23	1.40 (0.73-2.70)	59
2011	1.08 (0.34-3.47)	22	1.54 (0.77-3.08)	81
2012	0.75 (0.21-2.63)	19	1.34 (0.63-2.87)	68
Race				
White	Referent	69	Referent	259
Black	0.34 (0.13-0.85)*	5	0.77 (0.54-1.09)	42
Other	1.10 (0.63-1.90)	25	0.93 (0.66-1.30)	67
Marital status				
Married	Referent	46	Referent	211
Single	1.58 (1.00-2.48)*	36	1.09 (0.85-1.38)	118
Unknown	1.57 (0.76-3.22)	17	0.94 (0.60-1.49)	39
Insurance status				
Commercial	Referent	67	Referent	295
Medicare	-	28	1.04 (0.62-1.72)	41
Medicaid	-	2	1.05 (0.63-1.73)	18
Uninsured	-	1	1.15 (0.56-2.37)	8
Unknown	-	1	0.59 (0.26-1.33)	6
Robotically assisted				
No	Referent	59	Referent	320
Yes	1.66 (0.99-2.78)	40	0.53 (0.37-0.75)	48
Comorbidity (Elixhauser)				
0	Referent	0	Referent	115

	Uterine cancer		Endometrial hyperplasia	
	Prevalence ratio	**N**	**Prevalence ratio**	**N**
1	-	16	1.26 (0.96-1.64)	109
≥2	-	83	1.59 (1.22-2.06)*	144
Area of residence				
Metropolitan	Referent	91	Referent	343
Non-metropolitan	1.24 (0.49-3.11)	8	0.82 (0.46-1.47)	25
Region				
Northeast	Referent	18	Referent	59
Midwest	1.09 (0.45-2.65)	13	1.05 (0.56-1.95)	37
South	1.32 (0.61-2.87)	51	1.13 (0.66-1.94)	187
West	0.74 (0.30-1.83)	17	1.31 (0.72-2.41)	85
Hospital teaching status				
Teaching	Referent	53	Referent	146
Non-teaching	0.49 (0.26-0.93)*	46	1.06 (0.68-1.65)	222
Hospital bed size				
<400	Referent	50	Referent	207
400-600	0.83 (0.43-1.60)	34	0.92 (0.59-1.42)	84
>600	0.60 (0.26-1.36)	15	1.34 (0.76-2.34)	77

All of the clinical and demographic covariates listed were included in the model. Comorbidity was based on Elixhauser method. Area of residence is classified as either metropolitan or non-metropolitan based on population density. Comorbidity and insurance status were removed from the model of uterine cancer to allow convergence. Estimates are reported as prevalence ratios and 95% confidence intervals. Model-fit was assessed by a visual examination of the conditional residuals for each covariate in the model for departure from normality; no problems in fit were detected

*P<0.05.