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1 **Original article**

2 **Outcomes of robotic surgery for endometrial cancer in elderly women**

3

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29 **Author contribution**

30 JH designed the study, developed the methodology, collected data, performed statistical  
31 analysis and wrote the manuscript. ASB designed the study, developed the methodology,  
32 analyzed data and wrote the manuscript. MK collected data. FL, CNG, MD, LR and MG  
33 helped to interpret data. All the authors have reviewed and approved the final manuscript.

34

35 **Abstract**

36 **Introduction:** Few data have been reported on robot-assisted surgery in elderly. The  
37 objectives were to compare feasibility, complication data, and survival of patients under and  
38 upper the age of 70 who are managed for endometrial cancer by robot-assisted laparoscopy.

39 **Materials and Methods:** This is a retrospective comparative single-center study including  
40 patients treated between January 2007 and December 2016. Patients were divided into 2  
41 groups: less than 70 years and greater than or equal to 70 years. The primary endpoint was  
42 the rate of complications. The secondary endpoints were conversion rate and follow-up.

43 **Results:** 148 patients were included: 86 under 70 (group A) and 62 aged 70 and over (group  
44 B). More adhesiolysis was performed in group B ( $p<.01$ ); the pelvic and para-aortic lymph  
45 node dissection rates were not different between both groups ( $p=.2$  and  $p=.9$ ). The operating  
46 times were significantly longer in group B (220.1 vs. 234.4 minutes,  $p=.02$ ). The conversion  
47 rate was similar between the 2 groups ( $p=.7$ ). The tumors were endometrioid  
48 adenocarcinomas for 77.9 and 66.7% respectively ( $p=.2$ ), with grade 3 tumors more  
49 represented in older patients (24.4% vs. 48.4%,  $p<.01$ ). There were more tumors at high risk  
50 of recurrence after 70 years (33.7 vs. 45.2%,  $p=.04$ ). No significant difference was found for  
51 postoperative complications. There was no difference in overall survival ( $p=.7$ ) or  
52 progression-free survival ( $p=.2$ ). Undertreated women rate was similar in both groups ( $p=.1$ ).

53 **Conclusion:** Robotic surgery appears feasible and reproducible and could bring a benefit  
54 and allow optimal surgery without increasing the morbidity in the management of endometrial  
55 cancers whatever the age is.

56

57 **Key words:** Elderly; Endometrial neoplasm; Robotic-assisted laparoscopy.

58

59 **1. Introduction**

60 Endometrial cancer is the most common gynecological cancer worldwide after cervix cancer  
61 with incidence in 2018 about 382,069 new cases for 89,829 deaths[1]. It most often affects  
62 elderly women, with an average age of 68 years. With the aging of the population in  
63 developed countries, the incidence of the disease will continue to increase[2].

64 A lot of studies have shown that high age is an independent factor of poor prognosis in  
65 women with endometrial cancer[3,4]. In addition, elderly women have more comorbidities,  
66 more advanced and aggressive lesions requiring extensive surgical resection[5,6]. They are  
67 therefore at greater risk of immediate and late postoperative complications, which explains  
68 that they have less aggressive surgical treatment and are less eligible for adjuvant  
69 treatment[5,7]. Optimization of surgical treatment and staging would seem to improve their  
70 prognosis[8,9].

71 Standard surgical treatment for endometrial cancers includes total hysterectomy with bilateral  
72 salpingo-oophorectomy[2]. In the presence of high-risk tumors, more complex procedures  
73 are performed including pelvic and para-aortic lymph node dissections  $\pm$  omentectomy[8].  
74 Although robot-assisted surgery has been evaluated for many years in the management of  
75 this pathology, few data have been reported in the elderly population[10].

76 The objectives of this study were to compare the feasibility, the per- and post-operative data,  
77 and the survival of patients under and upper the age of 70 who are managed for endometrial  
78 cancer by robot-assisted laparoscopy.

79

## 80 **2.Materials and Methods**

### 81 *2.1.Patients*

82 All patients with histologically proven endometrial cancer who received minimally invasive  
83 robot-assisted laparoscopic surgical management were included. The characteristics were  
84 obtained from the medical databases and the anonymous data were recorded on a  
85 computerized database. The collection was conducted between January 2007 to December  
86 2016 within the Georges Pompidou European Hospital in Paris.

87 The entire cohort was divided into 2 groups according to their age: less than 70 years (Group  
88 A) and greater than or equal to 70 years (Group B).

89

### 90 *2.2.Surgical procedure*

91 The first version of the Da Vinci Surgical System was used up to 2012, then the Da Vinci Si  
92 Surgical System (Intuitive Surgical Inc. Sunnyvale, California, USA). All patients underwent a  
93 total hysterectomy and bilateral salpingo-oophorectomy. Since 2010, in accordance with the  
94 recommendations of the National Cancer Institute (INCa), pelvic and para-aortic  
95 lymphadenectomy have been performed only in patients with endometrial cancer at high risk  
96 (type 1 histology stage IB grade 3, type 2 histology)[8]. Para-aortic lymphadenectomy was  
97 performed by trans- or extra-peritoneal approach. Patients with early-stage endometrial  
98 cancer (low risk (type 1 histology stage IA grade 1-2) and intermediate-stage endometrial  
99 cancer (type 1 histology stage IA grade 3 and IB grade 1-2)) underwent pelvic sentinel node  
100 biopsy.

101

### 102 *2.3.Data collection*

103 Demographic characteristics (age, body mass index, comorbidities such as hypertension,  
104 diabetes, history of abdominal surgery), surgical (operating time, operating theatre time, type  
105 of lymph node dissection), histology (histological type, FIGO (International Federation of  
106 Gynecology-Obstetrics) and ESMO (European Society for Medical Oncology) classifications)

107 and follow-up (early and late complications, recurrence or death) have been recorded and  
108 compared between the 2 groups[8,11].

109 The primary endpoint was the rate of per and post-operative complications and the  
110 secondary endpoints were the rate of conversion in laparotomy and oncologic follow-up.

111 Postoperative complications were classified according to the Clavien-Dindo classification[12].

112 The length of stay was defined as the number of nights in hospitalization. Adequate

113 treatment for each patient was noted. Patients were considered undertreated if optimal

114 treatment was not realized. It was also noted that stadification surgery was performed, and

115 adjuvant treatments with chemotherapy, external beam radiotherapy and brachytherapy.

116 Recurrence was defined as the re-emergence of the disease locally or by regional or distal

117 metastatic evolution and confirmed by histological sampling or imaging. The recurrence site

118 and the period between surgery and the date of the first recurrence were recorded. Overall

119 survival was defined as the time between surgery and latest news date or death, and

120 progression-free survival as the time between surgery and the diagnosis of the evolution of

121 the disease. Data on alive patients were censored at the last follow-up visit.

122

#### 123 *2.4. Statistical analysis*

124 The results were expressed as mean  $\pm$  standard deviation or median [ranks]. The

125 frequencies were presented in percentage. We compared all the data using accurate Chi-2

126 or Fisher tests for categorical or ordinal variables and Student's t-test analysis for continuous

127 variables. P values below .05 were considered statistically significant. All analyzes were

128 performed using the statistical software R version 3.2.4[13].

129

130 **3.Results**

131 During the study period, 385 patients were treated for an endometrial cancer: 82 by  
132 laparotomy; 155 by laparoscopy; 148 by robotic-assisted procedures. Robotic surgery was  
133 first-line treatment approach according to its accessibility. Among 148 patients underwent  
134 robotic surgery for endometrial cancer, 86 were under 70 years and were included in group A  
135 and 62 were aged 70 and over and constituted the group B.

136

137 *3.1.Population characteristics*

138 The demographic and clinical characteristics were summarized in Table 1. The mean age  
139 between the 2 groups was significantly different (group A:  $60 \pm 6.8$  years vs. group B:  $77 \pm$   
140  $5.5$  years,  $p < .01$ ). The 2 groups were comparable in terms of Body Mass Index (BMI), parity  
141 and history of abdominal surgery. Patients over 70 years had more comorbidities: they had  
142 more Eastern Cooperative Oncology Group (ECOG) performance status 1 and 2 ( $p = .02$ ),  
143 hypertension ( $p = .01$ ) and had more often taken hormone replacement therapy ( $p = .02$ ). The  
144 main circumstance of discovery was the occurrence of postmenopausal bleeding (89.9% on  
145 average for both groups).

146

147 *3.2.Surgical procedures*

148 Surgical characteristics were summarized in Table 2. All patients underwent total  
149 hysterectomy with bilateral salpingo-oophorectomy in robotic-assisted laparoscopy.  
150 Interventions took place under general anesthesia, in Trendelenburg position. A double  
151 docking might be required in case of para-aortic lymphadenectomy. More adhesiolysis were  
152 performed in group B (13.9% vs. 35.4%,  $p < .01$ ). Sentinel lymph node procedure was  
153 performed in 55.8% of patients under age 70 versus 74.2% of elderly patients ( $p = .02$ ). Pelvic  
154 lymph node dissection was performed in 47 (54.7%) in group A versus 29 (46.8%) in group B  
155 without difference between groups ( $p = .2$ ). Thirty-four patients underwent para-aortic lymph  
156 node dissection and rates were not different between the groups (25.6% vs. 19.4%,  $p = .9$ ).  
157 Four para-aortic lymphadenectomies were performed retroperitoneally in group A versus tree



158 in group B. The operating times were significantly longer in group B (220.1 vs. 234.4  
159 minutes,  $p=.02$ ). Eleven patients in group A benefited from a reintervention for restaging  
160 against 4 in group B ( $p=NS$ ). The hospitalization time was similar between groups (6.5 days,  
161  $p=.8$ ).

162

### 163 *3.3. Tumor characteristics (Table 3)*

164 Tumors were endometrioid adenocarcinomas for 77.9% and 67.7% respectively ( $p=.2$ ), with  
165 grade 3 tumors more represented in older patients (29.1% vs. 43.5%,  $p<.01$ ). There were  
166 more tumors with high risk of recurrence after 70 years (33.7 vs. 45.2%,  $p=.04$ ). There was  
167 no significant difference in tumor stage, histology, histological type, or lymphovascular space  
168 invasion (LVSI).

169

### 170 *3.4. Surgical complications (Table 4)*

171 The conversion rate was similar between the 2 groups (5.8 vs. 3.2%,  $p=.7$ ). In patients over  
172 70 years, the 2 conversions in laparotomy were secondary to multiple adhesions. In the other  
173 group, 4 conversions in laparotomy and 1 conversion in laparoscopy were recorded for  
174 technical difficulties (2 of which were due to poor tolerance of an exaggerated Trendelenburg  
175 position).

176 The rates of intraoperative complications were also comparable (2.3% vs. 3.2%,  $p=1$ ). A  
177 sutured bladder and a sutured rectal serous wound were noted in group A. In the second  
178 group, there was a rectal serous and a vascular wound during para-aortic dissection.

179 No significant difference was found for early and late postoperative complications according  
180 to the Clavien-Dindo classification ( $p=.8$ ). In group B, there were 2 early complications  
181 (ureteral wound and evisceration on umbilical trocar port) requiring surgical revision. Other  
182 early complications required medical treatment only (3 pulmonary embolism, 1 occlusive  
183 syndrome and 1 wall hematoma). Late complications were secondary to pelvic lymphoceles  
184 (3), urinary sepsis and ureteral stenosis. In group A, early complications included 3 cases of  
185 sepsis (1 pyelonephritis, one wall abscess and one infected lymphocele), 2 pulmonary

186 emboli and 1 hemoperitoneum and 1 pneumothorax. In late complications, there were 5  
187 cases of pelvic lymphoceles and 1 lymphedema of the right lower limb and 1 case of  
188 pulmonary embolism, 1 hernia. When comparing comorbidities by procedure type, patients  
189 over 70 years with total hysterectomy and pelvic and para-aortic lymphadenectomies had  
190 more major complications (Clavien Dindo III and above) than patients under 70 years  
191 ( $p=.01$ ). Complications were similar whether patients had a total hysterectomy with ( $p=.3$ ) or  
192 without pelvic lymphadenectomy ( $p=.8$ ).

193

### 194 *3.5. Adjuvant treatments (Table 5)*

195 There was no difference in terms of adjuvant treatments between the two groups.  
196 Chemotherapy was given in 25.8% of patients in group B against 30.2% ( $p=.5$ ) in group A.  
197 Radiation (External Beam RadioTherapy (EBRT) and brachytherapy respectively) were similar  
198 too ( $p=.2$ ) with 35.5% and 50% of the cases in group B, compared to 39.5% and 43% in the  
199 group A. Among the elderly (group B), 21% did not receive the indicated treatment  
200 compared to 11.6% in the youngest patients (group A), with no significant difference  
201 between the two groups ( $p=.1$ )

202

### 203 *3.6. Follow-up (Table 5)*

204 The mean follow-up time in group A was 643.1 days compared to 550.4 days in group B.  
205 Mean time between surgery and relapse was 635.3 days for patients under 70 years and  
206 501.3 days for patients over 70 years of age. There was no difference in overall survival  
207 ( $p=.7$ ) as in progression-free survival between the 2 groups ( $p=.2$ ) (figure 1).

208

209 **4.Discussion**

210 Surgery is crucial for the treatment of endometrial cancers. The minimally invasive pathway  
211 demonstrated superiority over laparotomy in terms of morbidities, length of stay, quality of life  
212 and recovery[14]. The majority of randomized trials included low-risk patients. It has no  
213 impact on recurrence or survival[15]. With the rise of robotic surgery, many benefits have  
214 been demonstrated, especially in obese population[16].

215

216 Elderly care is proving to be a real public health problem. The incidence of endometrial  
217 cancer increase with age and tumors have worse prognosis[6,17]. It has been estimated that  
218 20% of older women waited at least 1 year between the first symptoms and the specialized  
219 consultation[18]. Due to a number of significant comorbidities, elderly women with  
220 endometrial cancer are also challenging for their surgical management. These patients have  
221 more often indications of additional intraoperative treatments such as extensive  
222 lymphadenectomies because of more several lesions[9,19,20]. In this work, older patients  
223 had more comorbidities. We did not show any statistical difference in terms of complications,  
224 nor conversion rate.

225

226 There is a higher rate of postoperative complications in elderly women such as episodes of  
227 occlusion, local infection or perioperative cardiac events[19]. Benefits of robotic surgery were  
228 a significant reduction in complication rates, bleeding, and length of hospital stay[14,21–23].  
229 Our complication rate was acceptable at 11.5% (12.9% in group B versus 10.5% in group A).  
230 This rate is consistent with the literature data described regardless of age[24]. Eddib *et al.* as  
231 Vaknin *et al.* compared surgical results in patients undergoing robotic hysterectomy and  
232 demonstrated that advanced age did not appear to be associated with increased risk of  
233 morbidity or adverse perioperative outcomes[25,26].

234 Our data confirm the data available in the literature in support of the safety of a robotic  
235 surgical approach for the treatment of elderly patients with endometrial cancer, in terms of

236 preoperative and postoperative morbidity rates, except the duration of hospitalization (table  
237 6).

238 In our study, length of hospital stay was similar in both groups (6.5 days,  $p=.7$ ) whereas  
239 several studies have found a shorter average length of hospital stay[14,22,25]. This can be  
240 explained by the advanced age of our patients who, for a quarter of them, wanted  
241 postoperative recovery.

242

243 Elderly patients develop more aggressive tumors associated with a poor prognosis[21,26].  
244 They are most often non-endometrioid tumors, associated with vascular emboli. Their  
245 disease is diagnosed at a later stage; in the case of endometrioid tumor, they are most often  
246 grade 3 tumors[22,27]. Our data found significantly more grade 3, advanced, and patients at  
247 high risk of recurrence.

248

249 Even in the absence of significance, it was found that the number of pelvic and para-aortic  
250 lymph node dissections performed was similar in the 2 groups with rates of 54.7% versus  
251 46.8% for pelvic procedures, and 25.6% versus 19.4% for para-aortic procedures,  
252 respectively ( $p=.5$ ). On the other hand, the number of undertreated patients was similar in  
253 both groups and concerns 13 elderly patients (21%) and 10 younger patients (11.6%). These  
254 were mainly lymph node staging. The main reasons for not receiving the indicated treatment  
255 were a reduced ECOG or medical/surgical contraindications. These data are in contradiction  
256 with the histological characteristics of tumors. They should have benefited from a greater  
257 number of lymph node staging, according to ESMO recommendations[8,11]. These data are  
258 in contrast with the findings of Eggeman *et al*, and Poupon *et al*, studies, which found that  
259 elderly were undertreated, had fewer lymphadenectomies and fewer adjuvant  
260 treatments[7,27].

261 In our cohort, 9 patients had recurrence during follow-up; one of the patients in group A did  
262 not benefit from para-aortic dissection while she belonged to the group at high risk of  
263 recurrence and 2 patients in group B were concerned. This can be explained by a difference

264 between the pre- and post-operative data, sometimes explaining an underprocessing or  
265 treatment not recommended beforehand[28].

266

267 Complete lymph node dissection increases operating time and complications[29]. But there is  
268 evidence that para-aortic lymphadenectomy improves prognosis in this population[30]. Older  
269 age should not be a contraindication to lymphadenectomy. These data allow us to highlight  
270 the interest of the sentinel lymph node in this population[31]. Paradoxically, it is less realized  
271 in the older subject[32]. In our study, the sentinel lymph node procedure was significantly  
272 more successful ( $p=.02$ ) in elderly patients in group B (74.2%) than in group B (55.8%).

273 Decreased survival secondary to poorer prognosis in balance with major complications  
274 secondary to complete surgery in patients with more comorbidities makes limit treatments[7].  
275 These data are confirmed, especially since the patients are over 70 years old; age beyond  
276 this limit becomes an independent prognostic factor[17]. Only half of older women will have  
277 the recommended treatment[6,18,19].

278

279 The limitations of our study are related to missing data on the assessment of overall patient  
280 satisfaction and quality of life. Other authors have shown that overall satisfaction with robotic  
281 procedure is very high regardless of age[22]. A notable limitation of this study is also the lack  
282 of systematic onco-geriatric evaluation to consider the vulnerabilities of each patient (G8  
283 score,...). Although this study is retrospective with a reduced effect, it positively assesses  
284 the feasibility of robotic surgery in staging surgery for endometrial cancer for the elderly  
285 patient, which is poorly represented in clinical studies.

286

287 **5.Conclusion**

288 Robotic surgery appears feasible and reproducible and can be proposed for the  
289 management of endometrial cancers regardless of age. Older patients have more aggressive  
290 and higher-risk tumors for which robotic surgery could provide a benefit and allow optimal  
291 surgery without increasing morbidity. New specific guidelines are needed for elderly patients  
292 with endometrial cancer.

293

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296

297 **Disclosure**

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299



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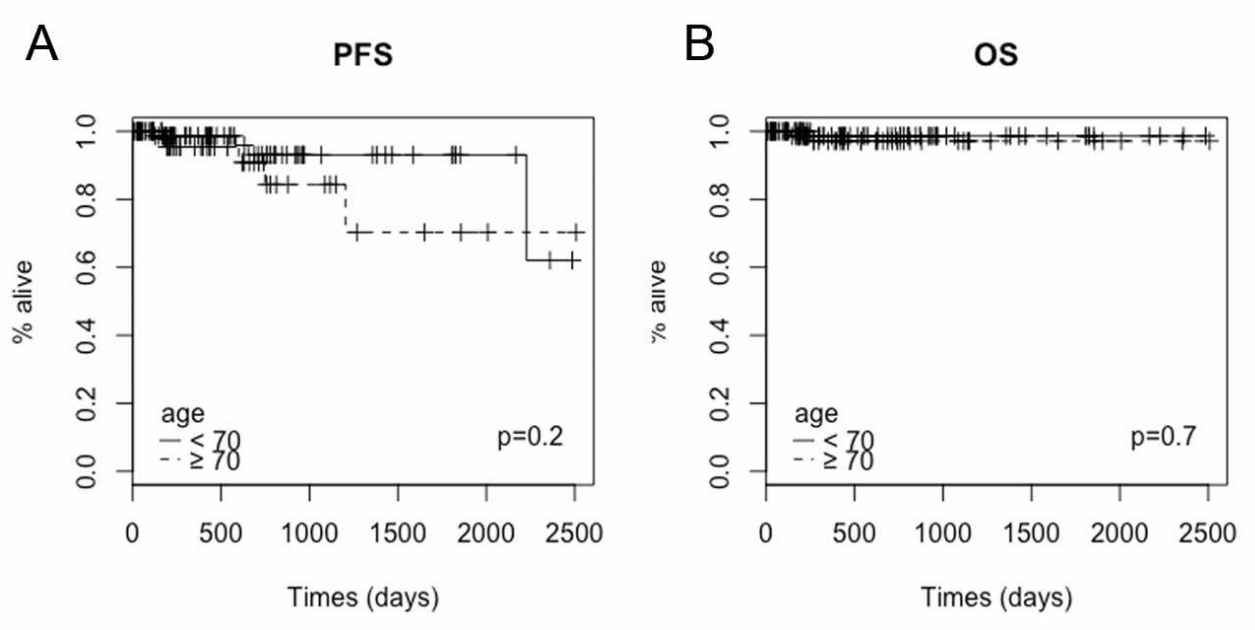
408 **Figure legends**

409 Figure 1. Survival for elderly women with endometrial cancer.

410 A) Progression-Free Survival (PFS) and B) Overall Survival (OS) depending on patient  
411 age.

412

1 Figure 1  
2



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4

**Table 1 – Demographic characteristics and comorbidities**

<b>Characteristics</b>	<b>Population (n=148)</b>	<b>Age &lt; 70 (n=86)</b>	<b>Age ≥ 70 (n=62)</b>	<b>P value</b>
<b>Mean age (years)</b>	67±10.6	60±6.8	77±5.5	<.01
<b>Mean BMI (kg/m<sup>2</sup>)</b>	26.9±8.5	28±10.3	25.6±4.9	NS
<b>ECOG PS</b>	-	-	-	.02
<b>0</b>	71.6 (106)	79.1 (68)	61.3 (38)	
<b>1</b>	19.6 (29)	15.1 (13)	25.8 (16)	
<b>2</b>	8.8 (13)	5.8 (5)	12.9 (8)	
<b>Parity</b>	1.3±1.3	1.3±1.4	1.4±1.3	NS
<b>Previous abdominal surgery</b>	44.6 (66)	43 (37)	46.8 (29)	NS
<b>Laparotomy</b>	32.4 (48)	29.1 (25)	37.1 (23)	-
<b>Laparoscopy</b>	8.8 (13)	11.6 (10)	4.8 (3)	-
<b>Vaginal</b>	3.4 (5)	3.5 (3)	3.2 (2)	-
<b>Hormonal replacement treatment</b>	22.1 (29)	15.4 (12)	32.1 (17)	.02
<b>Previous breast neoplasm</b>	14.2 (21)	11.6 (10)	17.7 (11)	NS
<b>Comorbidities</b>	-	-	-	-
<b>Hypertension</b>	33.8 (50)	25.6 (22)	45.2 (28)	.01
<b>Diabetes mellitus</b>	8.1 (12)	10.5 (9)	4.8 (3)	NS
<b>Discovery circumstances</b>	-	-	-	NS
<b>Post-menopausal bleeding</b>	89.9 (133)	90.7 (78)	88.7 (55)	-
<b>Others</b>	10.1 (15)	8.3 (8)	11.3 (7)	-

% (n) or mean ± standard deviation

BMI: Body Mass Index; ECOG PS: ECOG Performance Status; NS: Not Significant

**Table 2 – Surgical characteristics**

	<b>Population (n=148)</b>	<b>Age &lt; 70 (n=86)</b>	<b>Age ≥ 70 (n=62)</b>	<b>P value</b>
<b>Operating time</b>	227.8±90.9	220.1±78.2	234.4±100.9	.02
<b>Occupation roomtime</b>	295.3±92.8	291.6±86.2	298.5±99.4	NS
<b>Pelvic lymph node dissection</b>	51.4 (76)	54.7 (47)	46.8 (29)	NS
<b>Paraaortic lymph node dissection</b>	23 (34)	25.6 (22)	19.4 (12)	NS
<b>Omentectomy</b>	18.2 (27)	17.4 (15)	19.4 (12)	NS
<b>Adhesiolysis</b>	23.6 (35)	13.9 (12)	37.1 (23)	<.01
<b>Sentinel lymph node biopsy</b>	-	-	-	.02
<b>Yes</b>	63.5 (94)	55.8 (48)	74.2 (46)	-
<b>No</b>	36.5 (54)	44.2 (38)	25.8 (16)	-
<b>Hospitalization time (days)</b>	6.5±5.5	6.5±6.3	6.5±4.3	NS

% (n) or mean ± standard deviation

NS: Not Significant

**Table 3 – Histological characteristics**

	<b>Population (n=148)</b>	<b>Age &lt; 70 (n=86)</b>	<b>Age ≥ 70 (n=62)</b>	<b>P value</b>
<b>FIGO stage</b>	-	-	-	<i>NS</i>
<b>I</b>	72.3 (107)	73.2 (63)	71 (44)	
<b>II</b>	8.8 (13)	7 (6)	11.3 (7)	
<b>III</b>	14.2 (21)	15.1 (13)	12.9 (8)	
<b>IV</b>	4.7 (7)	2.7 (4)	4.8 (3)	
<b>Histological grade</b>	-	-	-	<i>&lt;.01</i>
<b>1</b>	40.5 (60)	48.8 (42)	29 (18)	
<b>2</b>	25 (37)	26.7 (23)	22.6 (14)	
<b>3</b>	34.5 (51)	24.4 (21)	48.4 (30)	
<b>Histology</b>	-	-	-	<i>NS</i>
<b>Endometrioid</b>	73.6 (109)	77.9 (67)	67.7 (42)	
<b>Serous</b>	8.8 (13)	7 (6)	11.3 (7)	
<b>Clear cells</b>	3.4 (5)	3.5 (3)	3.3 (2)	
<b>Other</b>	14.2 (21)	11.6 (10)	17.7 (11)	
<b>Myometrial invasion</b>	-	-	-	<i>.04</i>
<b>&lt; 50%</b>	58.1 (86)	34.9 (30)	51.6 (32)	
<b>≥ 50%</b>	41.9 (62)	65.1 (56)	48.4 (30)	
<b>Histological type</b>	-	-	-	<i>NS</i>
<b>1</b>	73.6 (109)	77.9 (67)	67.7 (42)	
<b>2</b>	26.4 (39)	22.1 (19)	32.3 (20)	
<b>Lymphovascular invasion</b>	-	-	-	
<b>Yes</b>	39 (57)	34.1 (29)	45.9 (28)	<i>NS</i>
<b>No</b>	61 (89)	65.9 (56)	54.1 (33)	
<b>Positive pelvic lymph nodes</b>	-	-	-	<i>NS</i>
<b>Yes</b>	21.9 (18)	26 (13)	15.6 (5)	
<b>No</b>	78.1 (64)	74 (37)	84.4 (27)	
<b>Average number</b>	14.4±9.3	14.8±9.1	13.9±9.7	<i>NS</i>
<b>Positive paraaortic lymph nodes</b>	-	-	-	<i>NS</i>
<b>Yes</b>	14.3 (6)	12.5 (3)	16.7 (3)	
<b>No</b>	85.7 (36)	87.5 (21)	83.3 (27)	
<b>Average number</b>	17.4±13.6	18.3±14.7	15.9±12.2	<i>NS</i>
<b>ESMO risk groups</b>	-	-	-	<i>.04</i>
<b>Low risk</b>	51.4 (76)	59.3 (51)	40.3 (25)	
<b>Intermediate risk</b>	10.1 (15)	7 (6)	14.5 (9)	
<b>High risk</b>	38.5 (57)	33.7 (29)	45.2 (28)	

% (n) or mean ± standard deviation

FIGO: International Federation of Gynecology and Obstetrics; ESMO: European Society for Medical Oncology; NS: Not Significant

1 **Table 4 – Surgical complications**

	<b>Population (n=148)</b>	<b>Age &lt; 70 (n=86)</b>	<b>Age ≥ 70 (n=62)</b>	<b><i>P value</i></b>
<b>Per-operative</b>	2.7 (4)	2.3 (2)	3.2 (2)	<i>NS</i>
<b>Digestive</b>	1	0	1	-
<b>Urinary</b>	1	1	0	-
<b>Vascular</b>	1	0	1	-
<b>Other</b>	1	1	0	-
<b>Post-operative</b>	11.5 (17)	10.5 (9)	12.9 (8)	<i>NS</i>
<b>Chronic</b>	8.9 (13)	9.3 (8)	8.1 (5)	<i>NS</i>
<b>Conversion rate</b>	4.7 (7)	5.8 (5)	3.2 (2)	<i>NS</i>

2 % (n)

3



**Table 5 – Adjuvant treatments and survival data**

	<b>Population (n=148)</b>	<b>Age &lt; 70 (n=86)</b>	<b>Age ≥ 70 (n=62)</b>	<b>P value</b>
<b>Reintervention for restaging</b>	10.1 (15)	12.8 (11)	6.5 (4)	<i>NS</i>
<b>No treatment</b>	38.5 (57)	43 (37)	32.3 (20)	<i>NS</i>
<b>Radiation</b>				<i>.2</i>
<b>No</b>	41.2 (61)	45.3 (39)	35.5 (22)	
<b>Brachytherapy</b>	45.9 (68)	43 (37)	50 (31)	
<b>EBRT</b>	37.8 (56)	39.5 (34)	35.5 (22)	
<b>Systemic therapy</b>				<i>.5</i>
<b>No</b>	71.6 (106)	69.8 (60)	74.2 (46)	
<b>Yes</b>	28.4 (42)	30.2 (26)	25.8 (16)	
<b>Undertreated</b>				<i>.1</i>
<b>Yes</b>	15.5 (23)	11.6 (10)	21 (13)	
<b>No</b>	84.5 (125)	88.4 (76)	79 (49)	
<b>Progression</b>	6.1 (9)	4.7 (4)	8.1 (5)	<i>NS</i>
<b>Progression-free survival (days)</b>	579.2±570.4	635.3±598.7	501.3±523.5	<i>NS</i>
<b>Death</b>	1.4 (2)	1.2 (1)	1.6 (1)	<i>NS</i>
<b>Overall survival (days)</b>	604.3±598.4	643.1±600.4	550.4±596.4	<i>NS</i>

% (n). EBRT=External Beam RadioTherapy

**Table 6. Comparative data in studies about robotic surgery for endometrial cancer in elderly patients**

Studies	Group of ages, years	Age, years, mean	Patients, n	Cancer type	Surgical approach	Conversion rate, %	Peri-operative complications, %	Hospital stay, days, mean
Lavoue et al, 2014 [21]	≥70	77.9	113	EC	Robotic	3	2*	3.1
Zeng et al, 2015 [5]	70-80/>80	74.8/84.2	75/31	EC	Robotic	1/3	1/10*	1.4/5.2
Aloisi et al, 2019 [20]	65-74/75-84/≥85	69/78/86.5	685/249/48	MIXTE	Robotic	NR	7.4/8/12.5	0/0/1
Bourgin et al, 2017 [18]	≥75	80	16	EC	Robotic	0	0*	4.5
Eddib et al, 2014 [25]	>70	77	29	EC	Robotic	NR	3	NR
Guy et al, 2016 [14]	≥65	73.4	1228	EC	Robotic	3	8.3	2
Vaknin et al, 2010 [26]	≥70	78	41	EC	Robotic	6	NR	2
Gallotta et al, 2018 [23]	65-75/≥75	71/77	144/60	MIXTE	Robotic	3.5/3.3	6.3/3.3	2/2
<b>Present study</b>	>70	77	62	EC	Robotic	3.2	3.2*	6.5

\*major complications rates (Clavien Dindo grade 3 and 4)

EC: Endometrial Cancer; MIXTE: Benign lesions, endometrial and cervical cancers; NR: Not Reported