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Original article

Oncological Results of the Educational Rectal Cancer Project in Spain 10 Years After Its Implementation☆

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ABSTRACT

Introduction: The objective of this observational, prospective, multicenter and multilevel study was to evaluate the oncological outcomes (local recurrence, metastasis and overall survival) of the Rectal Cancer Project of the Spanish Association of Surgeons (AEC) 10 years after its initiation, comparing the results with Scandinavian registries.

Methods: The AEC teaching project database includes 17 620 patients to date, of which 4508 were operated on with a potentially curative resection between March 2006 and December 2010. All of them come from the first 59 hospitals included in the project, and therefore followed for at least 5 years, and are the subject of the present study.

Results: The cumulative incidence of local recurrence was 7.3 (95% CI: 8.2–6.5), metastasis 21.0 (CI 95%: 22.4–19.7) and overall survival 72.3 (CI 95%: 80.3–77.6). The multilevel regression analysis with the hospital variable as a random effect, showed a significant variation among the hospitals for the cancer outcome variables: general survival, local recurrence and metastasis (δ^2=0.053).

Conclusions: This study indicates that the results observed in the AEC' Rectal Cancer Project are inferior than those observed in the Scandinavian registries that we tried to emulate and that this is attributable to the variability of practice in some centers.

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◇ In Appendix you can consult the list of the participating centers in the Project of the Ca'ncer de Recto of the Spanish Association of Surgeons.

Resultados oncológicos del Proyecto docente del Cáncer de Recto en España 10 años después de su inicio

Palabras clave:
Cáncer de recto
Recidiva local
Metástasis
Supervivencia global

RESUMEN

Introducción: El objetivo de este estudio observacional, prospectivo, multicéntrico y multinivel ha sido evaluar los resultados oncológicos (recidiva local, metástasis y supervivencia global) del Proyecto del Cáncer de Recto de la Asociación Española de Cirujanos (AEC) 10 años después de su inicio, comparando los resultados con los registros escandinavos.

Métodos: La base de datos del proyecto docente de la AEC incluye hasta la fecha a 17.620 pacientes, de los cuales 4.508 fueron operados con una resección potencialmente curativa entre marzo de 2006 y diciembre de 2010. Todos ellos son provenientes de los primeros 59 hospitales incluidos en el proyecto, y por tanto seguidos al menos durante 5 años, y constituyen el objeto del presente estudio.

Resultados: La incidencia acumulada de recidiva local fue 7,3 (IC 95%: 8,2-6,5), la de metástasis fue 21.0 (IC 95%: 22,4-19,7) y la de supervivencia global, 72,3 (IC 95%: 80,3-77,6). El análisis de regresión multinivel, con la variable hospital como un efecto aleatorio, mostró una variación significativa entre los hospitales para las variables de resultado oncológico: supervivencia general, recidiva local y metástasis ($\delta 2 = 0{,}053$).

Conclusiones: Este estudio indica que los resultados observados en el Proyecto del Cáncer de Recto de la AEC son inferiores a los observados en los registros de Escandinavia a los que tratamos de emular y que ello es atribuible a la variabilidad de la práctica en algunos centros.

Introduction

In order to determine the oncological results of rectal cancer treatment in Spain and whether these outcomes could be improved, the Spanish Association of Surgeons (*Asociación Española de Cirujanos*, AEC) introduced a project[1] in 2006 inspired by the Norwegian Colon and Rectal Cancer Project.[2] The objective of this teaching initiative was to disseminate and systematize mesorectal excision surgery initially, and later extended abdominoperineal excision,[3] to the multidisciplinary groups of the 105 hospitals of the National Healthcare System that requested it and fulfilled the required conditions from 2006 to 2012 (Appendix).

The aim of this study was to evaluate the oncological results achieved by this teaching initiative 10 years after its inception and to determine whether these results have achieved the quality standards observed in the registries of the Scandinavian countries, which this project attempts to imitate.

Methods

This multicenter observational study was carried out using the prospective database of the Rectal Cancer Project of the AEC.

Patient selection. Included for study were patients who had been treated with elective surgery at the first 59 hospitals included in the project, between March 1, 2006 and December 1, 2010, with curative resections of the rectum and with or without restoration of intestinal continuity: anterior resection (AR); abdominoperineal resection (APR) and Hartmann procedure.

We excluded non-surgical patients and those treated with non-resective operations: exploratory laparotomy or laparoscopy, stoma, and diversions. Also excluded were those who underwent the following techniques: local resection, proctocolectomy, and pelvic exenteration. Excluded as well were patients whose operations were not considered curative and patients with involvement of the distal histopathological margin and patients with urgent surgery.

Study variables. The study outcome variables were: local recurrence, metastases that appeared during follow-up, and overall survival. Confounding variables included: sex, age categorized into 3 groups (<65, 65–80, >80 years), surgical risk (measured by the ASA anesthetic risk level), tumor location classified into 3 groups from the anal margin (0–6, 7–12, 13–15 cm), type of mesorectal excision (partial or total), type of operation performed (AR, APR, Hartmann procedure), intraoperative perforation of the tumor or rectum, status of the circumferential resection margin (CRM) (free or tumor invasion), use of neoadjuvant and adjuvant treatment, and the pathological stage of the tumor.

Definitions and standards. According to the Clasificación Internacional de Enfermedades (CIE10-C20), rectal tumors were defined as those situated in the last 15 cm measured from the anal margin using rigid rectoscope or magnetic resonance imaging (MRI).[4]

A resection was considered potentially curative in those cases in which a locally radical procedure was performed with free distal and circumferential margins or with microscopic invasion of these margins (R0 and R1) in the absence of metastasis.

The pathologic tumor stage was classified with the fifth edition of the TNM classification (American Joint Committee on Cancer stages I–IV; fifth edition).[5] Intraoperative perforation was defined as any defect of the rectal wall caused by the operation that brought the lumen of the rectum into contact with the surface. The CRM was considered invaded if neoplastic cells were found 1 mm or less away.

Local recurrence was defined as the reappearance of the disease in the pelvis, including: the anastomosis and perineal wound, regardless of whether the patient had distant metastasis. Isolated recurrence in the ovaries was considered metastasis.

Given the anonymity of hospitals and patients, approval by the ethics committees of the centers included was not considered necessary, although the project had been endorsed by these committees.

Statistical Analysis

Before conducting the analyses, an exploratory analysis of the data was used to detect extreme cases, non-response and lost cases. A univariate descriptive analysis was carried out, where

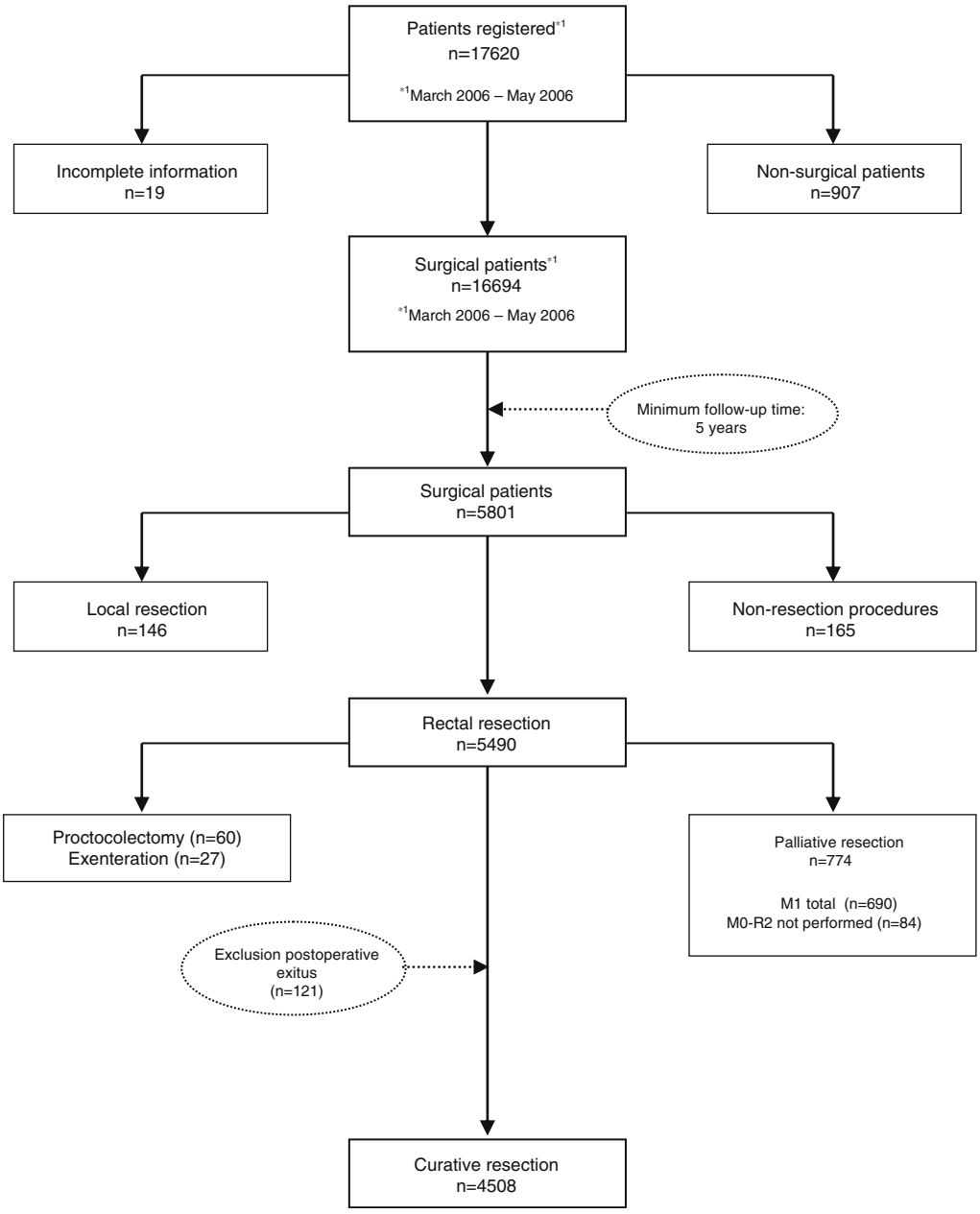

Fig. 1 – Flow diagram of the patients included in the project and in the study.

Table 1 – Description of the Patient Sample (*n*=4508).

	n	(%)
Sex		
Female	1552	(34.4)
Male	2956	(65.6)
Age (yrs)		
<65	1702	(37.8)
65–80	2204	(48.9)
> 80	600	(13.3)
ASA		
ASA I	276	(6.1)
ASA II	2451	(54.4)
ASA III	1631	(36.2)
ASA IV	150	(3.3)
Tumor location (cm)		
15–13	512	(11.4)
12–7	2199	(48.8)
0–6	1797	(39.9)
Surgical technique		
Resection	3085	(68.4)
Amputation	1058	(235)
Hartmann	365	(8.1)
Mesorectal excision		
Partial	939	(20.8)
Total	3569	(79.2)
Intraoperative perforation		
No	4282	(95.0)
Yes	226	(5.0)
Invasion of the CRM		
Free	4090	(90.7)
Affected	418	(9.3)
Neoadjuvant treatment		
No	1810	(40.2)
Yes	2698	(59.8)
Adjuvant treatment		
No	1668	(37.0)
Yes	2816	(62.5)
No data	24	(0.5)
Pathologic tumor stage		
I	1299	(28.8)
II	1355	(30.1)
III	1415	(31.4)
0	195	(4.3)
No data	244	(5.4)

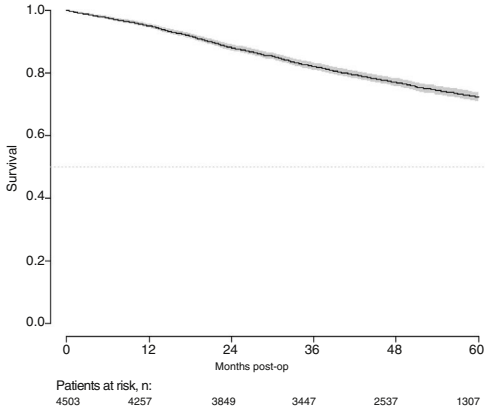

Fig. 2 – Accumulated incidence of local recurrence.

the quantitative variables were summarized by means and standard deviation and the categorical variables by frequencies and percentages. The results related with the incidence of recurrence, metastasis and overall survival were presented as the total number of events and 95% confidence interval (95% CI). Patients were considered at risk for experiencing the indicated events until death, loss of follow-up due to change of city of residence or end of follow-up after 5 years. The incidence of these events was estimated using the Kaplan–Meier method.

Confounding variables that had a significant impact on overall survival, local recurrence and metastasis at follow-up were identified with Cox proportional hazards models. The adjustment was considered necessary to correct the confounding bias if the change between the adjusted and unadjusted effect was greater than 10%. The assumption of proportional risks was evaluated by the Therneau-Grambsch approach. The results were expressed as the hazard ratio (HR) and its 95% CI.

Since patients at the same hospital are more likely to have similar oncological outcomes (depending on patient and tumor characteristics) than those observed at other hospitals, the logistic regression was extended with the hospital variable

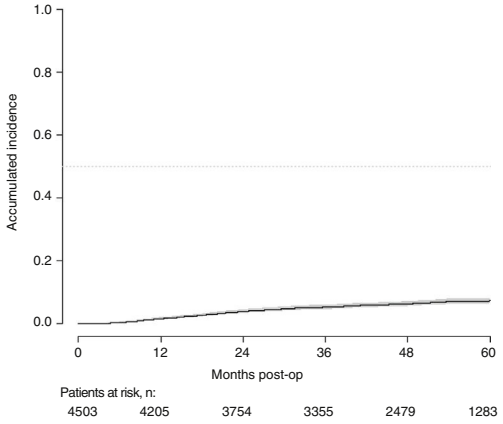

Fig. 3 – Accumulated incidence of metastasis.

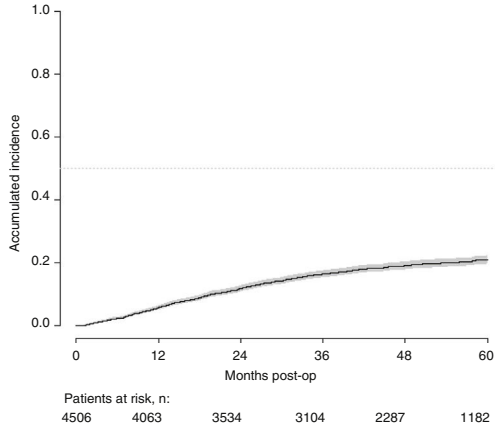

Fig. 4 – Accumulated incidence of mortality.

Table 2 – Influence of the Confounding Variables on Overall Survival.

Variable	Overall Survival		Univariate Analysis		Multivariate Analysis	
	No Event	Event	HR [IC 95%]	P	HR [IC 95%]	P
	n=3334	n=1.169				
Sex						
Females	1183 (35.5%)	367 (31.4%)	1		1	
Males	2151 (64.5%)	802 (68.6%)	1.17 [1.03–1.32]	.013	1.23 [1.08–1.39]	.001
Age (yrs)						
<65	1421 (42.6%)	279 (23.9%)	1		1	
65–80	1610 (48.3%)	593 (50.7%)	1.78 [1.55–2.05]	<.001	1.44 [1.24–1.68]	<.001
>80	303 (9.1%)	297 (25.4%)	4.02 [3.41–4.74]	<.001	2.49 [2.06–3.00]	<.001
ASA						
ASA I	250 (7.50%)	26 (2.22%)	1		1	
ASA II	1965 (58.9%)	483 (41.3%)	2.22 [1.50–3.30]	<.001	1.82 [1.22–2.72]	.003
ASA III	1039 (31.2%)	590 (50.5%)	4.70 [3.17–6.96]	<.001	2.90 [1.93–4.35]	<.001
ASA IV	80 (2.40%)	70 (5.99%)	6.72 [4.28–10.54]	<.001	3.43 [2.15–5.48]	<.001
Tumor location (cm)						
15–13	391 (11.7%)	121 (10.4%)	1		1	
12–7	1646 (49.4%)	549 (47.0%)	1.11 [0.91–1.35]	.289	1.09 [0.84–1.40]	.521
6–0	1297 (38.9%)	499 (42.7%)	1.27 [1.04–1.54]	.020	1.17 [0.87–1.57]	.302
Surgical technique						
Resection	2406 (722%)	675 (57.7%)	1		1	
APR	733 (22.0%)	324 (27.7%)	1.52 [1.33–1.74]	<.001	1.17 [0.98–1.39]	.092
Hartmann	195 (5.85%)	170 (14.5%)	2.82 [2.38–3.34]	<.001	1.59 [1.33–1.90]	<.001
Mesorectal excision						
Partial	711 (21.3%)	228 (19.5%)	1		1	
Total	2623 (78.7%)	941 (80.5%)	1.12 [0.97–1.29]	.127	1.12 [0.91–1.37]	.295
Intraoperative perforation						
No	3213 (96.4%)	1064 (91.0%)	1		1	
Yes	121 (3.63%)	105 (8.98%)	2.16 [1.77–2.64]	<.001	1.39 [1.13–1.72]	.002
Invasion of the CRM						
Free	3126 (93.8%)	959 (82.0%)	1		1	
Invasion	208 (6.24%)	210 (18.0%)	2.73 [2.35–3.17]	<.001	1.84 [1.57–2.16]	<.001
Neoadjuvant treatment						
No	1269 (38.1%)	541 (46.3%)	1		1	
Yes	2065 (61.9%)	628 (53.7%)	0.74 [0.66–0.83]	<.001	1.04 [0.92–1.19]	.517
Adjuvant treatment						
No	1177 (35.3%)	489 (41.8%)	1		1	
Yes	2139 (64.2%)	674 (57.7%)	0.77 [0.69–0.87]	<.001	0.82 [0.72–0.94]	.005
No data	18 (0.54%)	6(0.51%)	1.20 [0.54–2.68]	.659	1.09 [0.49–2.46]	.827
Pathologic tumor stage						
I	1074 (32.2%)	224 (19.2%)	1		1	
II	1026 (30.8%)	329 (28.1%)	1.49 [1.26–1.77]	<.001	1.38 [1.16–1.64]	<.001
III	837 (25.1%)	574 (49.1%)	2.79 [2.39–3.25]	<.001	2.68 [2.27–3.17]	<.001
0	180 (5.40%)	15 (1.28%)	0.42 [0.25–0.71]	.001	0.50 [0.29–0.84]	.009
No data	217 (6.51%)	27 (2.31%)	0.64 [0.43–0.96]	.031	0.75 [0.50–1.13]	.168

as a random effect to correct for the non-independence of the data.

The analyses were made with the statistical packages by IBM SPSS (version 24), R (version 3.3.2) and STATA IC13, with a level of significance of 0.05.

Results

Between 2006 and 2012, the multidisciplinary groups (MDG) of 105 hospitals were trained in 10 courses. Of these, 23 abandoned the project and 6 hospitals have merged, leaving 3 in their place. In total, and to date, the 79 participating centers have included 17 620 patients in the database.

The results presented in this study were observed in patients treated electively with curative rectal resection in the 59 participating centers between March 1, 2006 and December 31, 2010, thus having a minimum of 5 years of follow-up. In this period, once the exclusion criteria indicated in the flow chart were applied (Fig. 1), 4716 consecutive patients were treated with curative rectal resection, 4508 of which survived

Table 3 – Influence of the Confounding Variables on Local Recurrence.

Variable	Local Recurrence		Univariate Analysis		Multivariate Analysis	
	No Event	Event	HR [95%CI]	P	HR [95%CI]	P
	n=4224	n=279				
Sex						
Female	1465 (34.7%)	85 (30.5%)	1		1	
Male	2759 (65.3%)	194 (69.5%)	1.22 [0.95–1.58]	.124	1.30 [1.01–1.69]	.045
Age (yrs)						
<65	1586 (37.5%)	114 (40.9%)	1		1	
65–80	2084 (49.3%)	119 (42.7%)	0.86 [0.67–1.11]	.253	0.76 [0.58–1.00]	.046
>80	554 (13.1%)	46 (16.5%)	1.45 [1.03–2.04]	.035	0.97 [0.65–1.44]	.880
ASA						
ASA I	264 (6.25%)	12 (4.30%)	1		1	
ASA II	2309 (54.7%)	139 (49.8%)	1.37 [0.76–2.48]	.290	1.34 [0.74–2.44]	.334
ASA III	1511 (35.8%)	118 (42.3%)	1.97 [1.09–3.58]	.025	1.79 [0.96–3.34]	.066
ASA IV	140 (3.31%)	10 (3.58%)	1.95 [0.84–4.52]	.118	1.53 [0.64–3.67]	.342
Tumor location (cm)						
15–13	487 (11.5%)	25 (8.96%)	1		1	
12–7	2070 (49.0%)	125 (44.8%)	1.21 [0.79–1.86]	.383	0.91 [0.53–1.56]	.737
6–0	1667 (39.5%)	129 (46.2%)	1.57 [1.02–2.41]	.040	1.33 [0.73–2.43]	.350
Surgical technique						
Resection	2927 (69.3%)	154 (55.2%)	1		1	
APR	985 (23.3%)	72 (25.8%)	1.46 [1.11–1.94]	.008	0.81 [0.57–1.16]	.260
Hartmann	312 (7.39%)	53 (19.0%)	3.84 [2.81–5.24]	<.001	2.50 [1.79–3.51]	<.001
Mesorectal excision						
Partial	895 (21.2%)	44 (15.8%)	1		1	
Total	3329 (78.8%)	235 (84.2%)	1.45 [1.05–2.00]	.025	1.50 [0.97–2.32]	.071
Intraoperative perforation						
No	4048 (95.8%)	229 (82.1%)	1		1	
Yes	176 (4.17%)	50 (17.9%)	4.97 [3.66–6.75]	<.001	2.78 [1.98–3.90]	<.001
Invasion of the CRM						
Free	3881 (91.9%)	204 (73.1%)	1		1	
Invasion	343 (8.12%)	75 (26.9%)	4.63 [3.55–6.03]	<.001	2.90 [2.15–3.91]	<.001
Neoadjuvant treatment						
No	1694 (40.1%)	116 (41.6%)	1		1	
Yes	2530 (59.9%)	163 (58.4%)	0.90 [0.71–1.14]	.397	1.06 [0.81–1.40]	.655
Adjuvant treatment						
No	1574 (37.3%)	92 (33.0%)	1		1	
Yes	2628 (62.2%)	185 (66.3%)	1.13 [0.88–1.46]	.325	0.95 [0.71–1.27]	.722
No data	22 (0.52%)	2 (0.72%)	1.94 [0.48–7.87]	.355	1.83 [0.45–7.51]	.400
Pathologic tumor stage						
I	1248 (29.5%)	50 (17.9%)	1		1	
II	1275 (30.2%)	80 (28.7%)	1.61 [1.13–2.30]	.008	1.28 [0.88–1.84]	.194
III	1272 (30.1%)	139 (49.8%)	2.99 [2.16–4.13]	<.001	2.22 [1.56–3.14]	<.001
0	192 (4.55%)	3 (1.08%)	0.38 [0.12–1.21]	.100	0.37 [0.12–1.20]	.098
No data	237 (5.61%)	7 (2.51%)	0.74 [0.34–1.64]	.462	0.77 [0.35–1.71]	.523

the operation and were included in the analysis of the oncological results.

The characteristics of this cohort of patients are shown in Table 1. In 3085 (68.4%) patients AR was performed, 1058 (23.5%) were treated with APR, and 365 (8.1%) with the Hartmann procedure.

With a follow-up of at least 5 years, the cumulative incidence of local recurrence was 7.3% (95% CI: 6.5–8.2) (Fig. 2), the rate of metastasis at follow-up was 21% (95% CI: 19.7–22.4) (Fig. 3) and overall survival was 72.3% (95% CI: 70.9–73.8) (Fig. 4).

The results of the univariate and multivariate analyses performed to determine the influence of confounding variables on the oncological results are shown in Tables 2–4. Intraoperative perforation, CRM invasion, advanced tumor stages and the Hartmann procedure negatively influenced the 3 outcome variables: local recurrence, metastasis in follow-up and overall survival. Male sex also negatively influenced local recurrence and overall survival. In addition, advanced patient age and higher ASA risk negatively influenced overall survival.

Table 4 – Influence of the Confounding Variables on Metastasis.

Variable	Metastasis During Follow-Up		Univariate Analysis		Multivariate Analysis	
	No Event	Event	HR [95%CI]	P	HR [95%CI]	P
	n=3673	n=833				
Sex						
Females	1274 (34.7%)	277 (33.3%)	1		1	
Males	2399 (65.3%)	556 (66.7%)	1.07 [0.93–1.24]	.330	1.11 [0.96–1.29]	.150
Age (yrs)						
<65	1372 (37.4%)	330 (39.6%)	1		1	
65–80	1815 (49.4%)	389 (46.7%)	0.96 [0.83–1.11]	.600	0.92 [0.79–1.07]	.278
>80	486 (13.2%)	114 (13.7%)	1.20 [0.97–1.48]	.094	1.02 [0.80–1.29]	.904
ASA						
ASA I	241 (6.56%)	35 (4.20%)	1		1	
ASA II	1989 (54.2%)	461 (55.3%)	1.58 [1.12–2.23]	.009	1.55 [1.09–2.19]	.014
ASA III	1319 (35.9%)	311 (37.3%)	1.77 [1.25–2.51]	.001	1.65 [1.15–2.38]	.007
ASA IV	124 (3.38%)	26 (3.12%)	1.75 [1.05–2.91]	.031	1.59 [0.94–2.70]	.082
Tumor location (cm)						
15–13	416 (11.3%)	96 (11.5%)	1		1	
12–7	1829 (49.8%)	368 (44.2%)	0.90 [0.72–1.13]	.378	0.84 [0.63–1.13]	.252
6–0	1428 (38.9%)	369 (44.3%)	1.14 [0.91–1.43]	.241	0.99 [0.71–1.40]	.972
Surgical technique						
Resection	2579 (70.2%)	505 (60.6%)	1		1	
APR	819 (22.3%)	238 (28.6%)	1.50 [1.29–1.75]	<.001	1.21 [0.99–1.49]	.067
Hartmann	275 (7.49%)	90 (10.8%)	1.95 [1.55–2.44]	<.001	1.52 [1.20–1.93]	<.001
Mesorectal excision						
Partial	775 (21.1%)	164 (19.7%)	1		1	
Total	2898 (78.9%)	669 (80.3%)	1.09 [0.92–1.29]	.318	1.10 [0.85–1.41]	.474
Intraoperative perforation						
No	3520 (95.8%)	760 (91.2%)	1		1	
Yes	153 (4.17%)	73 (8.76%)	2.23 [1.76–2.84]	<.001	1.41 [1.09–1.82]	.008
Invasion of the CRM						
Free	3411 (92.9%)	677 (81.3%)	1		1	
Invasion	262 (7.13%)	156 (18.7%)	2.95 [2.48–3.51]	<.001	1.76 [1.46–2.13]	<.001
Neoadjuvant treatment						
No	1492 (40.6%)	318 (38.2%)	1		1	
Yes	2181 (59.4%)	515 (61.8%)	1.05 [0.91–1.21]	.507	1.25 [1.07–1.47]	.006
Adjuvant treatment						
No	1420 (38.7%)	247 (29.7%)	1		1	
Yes	2232 (60.8%)	583 (70.0%)	1.36 [1.18–1.58]	<.001	0.96 [0.81–1.13]	.618
No data	21 (0.57%)	3 (0.36%)	1.00 [0.32–3.12]	.998	0.73 [0.23–2.27]	.582
Pathologic tumor stage						
I	1182 (32.2%)	116 (13.9%)	1			
II	1138 (31.0%)	217 (26.1%)	1.94 [1.55–2.43]	<.001	1.76 [1.40–2.22]	<.001
III	941 (25.6%)	473 (56.8%)	4.72 [3.85–5.79]	<.001	4.28 [3.45–5.30]	<.001
0	187 (5.09%)	8 (0.96%)	0.43 [0.21–0.88]	.021	0.40 [0.19–0.81]	.011
No data	225 (6.13%)	19 (2.28%)	0.87 [0.54–1.42]	.584	0.82 [0.50–1.33]	.420

The results of the logistic regression model, with the hospital variable as a random effect, showed a significant variation among the hospitals for all the result variables (Figs. 5–7).

Discussion

This study shows a local recurrence rate of 7.3% (95% CI: 6.5–8.2), metastasis during follow-up of 21% (95% CI: 19.7–22.4) and overall survival of 72.3% (95% CI: 70.9–73.8) observed in the Rectal Cancer Project in a cohort of 4508 consecutive patients followed for 5 years.

The greatest weakness of this study has to do with the voluntary nature of inclusion of the data in the AEC Rectal Cancer Project, especially when compared to the registries of the Scandinavian countries,[6–8] in which the inclusion of data in the registry is mandatory. However, as already indicated in more detail,[9] various initiatives have been taken to avoid voluntary or involuntary inclusion and information biases.

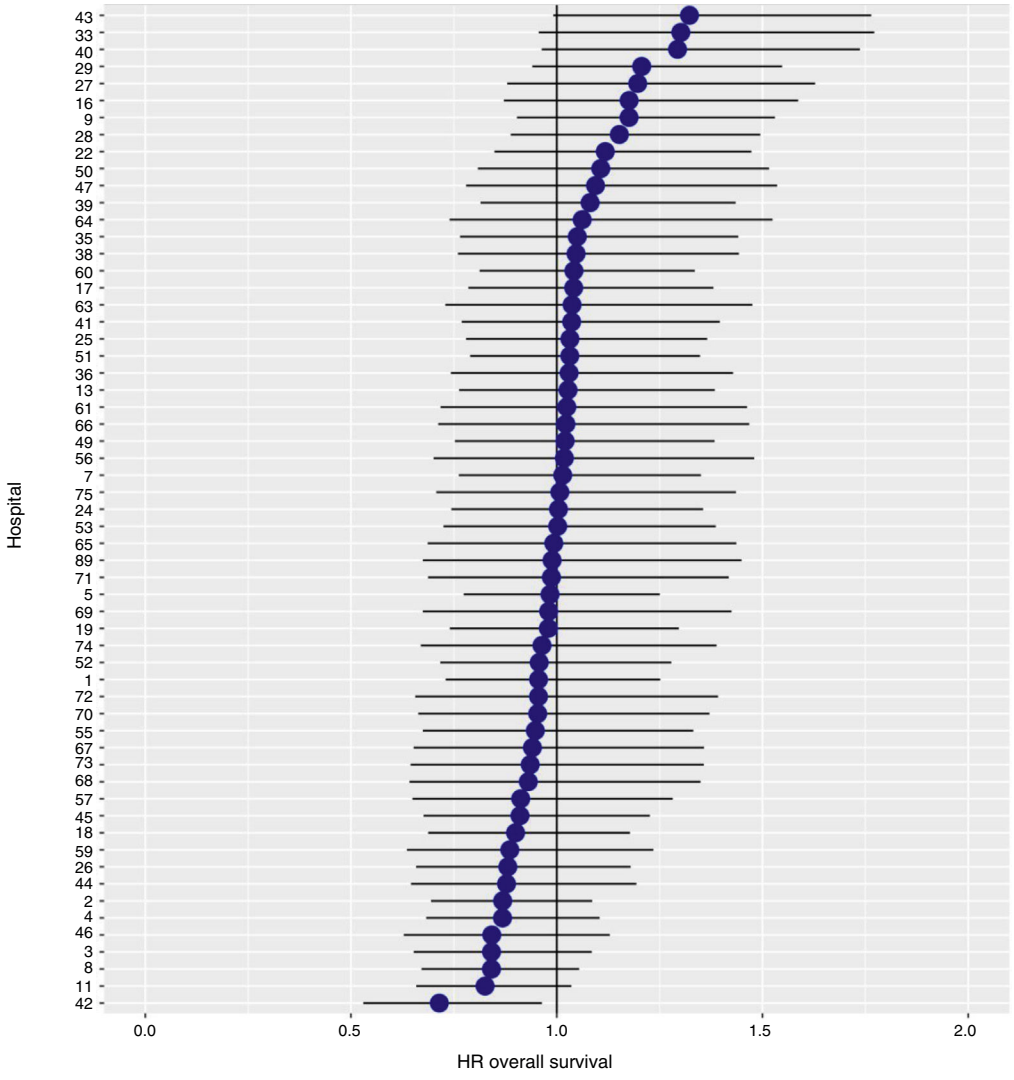

Fig. 5 – Differences in survival rates among the hospitals studied. The hospitals are represented in the vertical axis with their assigned number code for the project. The HR value is shown for each hospital.

Unfortunately, due to the anonymous nature of the data and the lack of other sources to verify the information in our country, the data from this study indicate the recorded rates of local recurrence, metastasis and overall survival.

The risk factors for tumor recurrence, and therefore worse oncological results, coincide with previous descriptions[10] (tumor perforation, CRM invasion, advanced tumor stages and Hartmann procedure) with no significant associations.

The results observed in the AEC Rectal Cancer Project are lower than those observed in the Scandinavian registries that we attempt to emulate. The local recurrence rate (7.3%) is higher than that observed in Norway (5.0%)[6] and Sweden (4.0%)[7]; this result indicator is not evaluated in the Danish registry.[8] The overall survival rate in this project (72.3%) is between the rates published by the Norwegian and Swedish registries (81%)[7] and the Danish registry (68%).[8]

In addition, the rate of local recurrence observed in this study, in which the results of 59 hospitals have been used, has been slightly higher than the rate observed in a previous analysis of the data provided by the first 36 hospitals integrated in the study (6.6%).[10] However, this negative variation of the results has also been observed in the Norwegian and Swedish registries, in which the local recurrence figures have increased from 3 to 5 and 4%, respectively.[7] So, perhaps the explanation of this fact could be attributed to the loss of attention of the multidisciplinary teams of some hospitals and to interhospital differences.

In conclusion, the results of this study indicate that the results observed in the AEC Rectal Cancer Project are inferior to those observed in the Scandinavian registries that we try to emulate, and that this is attributable to the variability of the practice at some hospitals.

Authorship

All the authors have participated in the study design, article composition, critical review and approval of the final version.

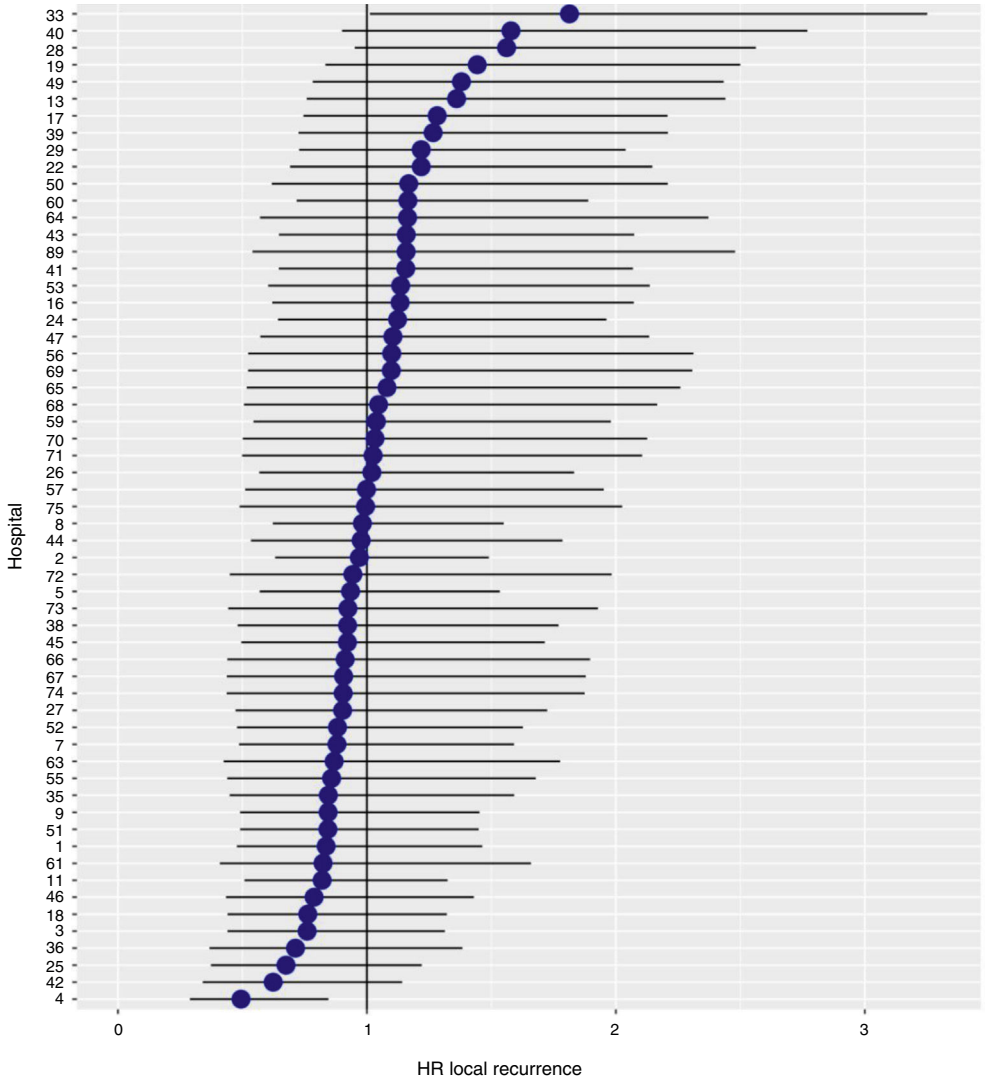

Fig. 6 – Differences in local recurrence rates among the hospitals studied. The hospitals are represented on the vertical axis with the number code assigned to them in the project. The HR value is shown for each hospital.

María Buxó was responsible for the data collection, data analysis and statistical analysis.

Conflict of Interests

The authors have no conflict of interests to declare.

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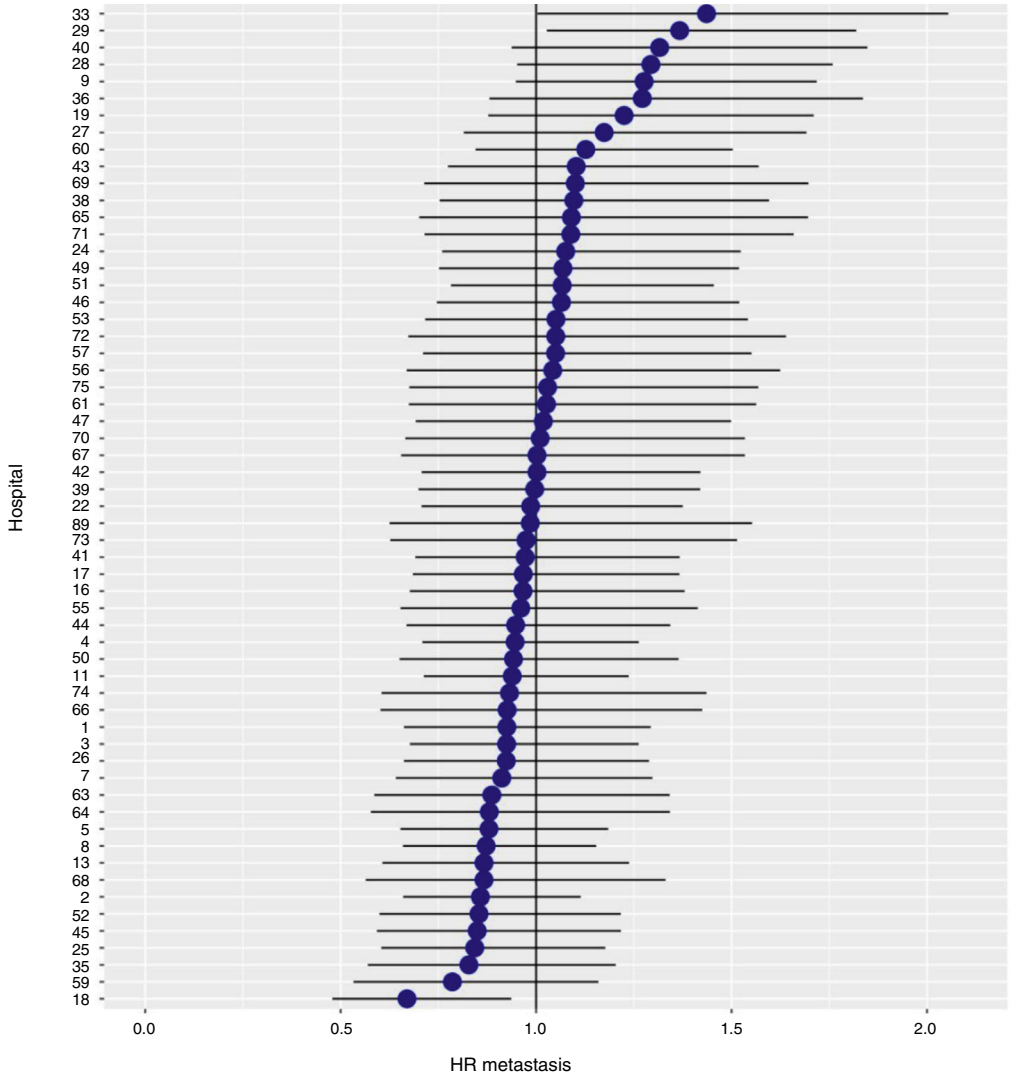

Fig. 7 – Differences in the rates of metastasis among the hospitals studied. The hospitals are represented on the vertical axis with the number code assigned to each hospital in the project. The HR value is shown for each hospital.

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