Agència de Qualitat i Avaluació Sanitàries de Catalunya

Generalitat de Catalunya
Departament de Salut

Does the hospital influence the choice of the surgical procedure for abdominal aortic aneurysm repair? What consequences does it have?

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Introduction

- Abdominal aortic aneurysm (AAA) is defined as an increase in aortic diameter greater than 50% of its original measure (≈2cm)
- The most severe clinical consequence is its **rupture**, that is lethal without intervention and has a mortality rate of 51% in case of intervention
- There are two ways to repair the AAA:
  - open surgery
  - endovascular repair (EVAR)

Open surgery vs endovascular repair

Endovascular repair (EVAR):

- ↑ Less invasive, shorter length of stay, less morbidity and mortality in the short term
- ↓ Survival advantage disappears with time (2 years), late complications. Image controls are required and secondary interventions are more frequent

Open surgery:

- ↑ Recommended by CPGs in patients with low surgical risk (young people with no comorbidity)
- ↓ Higher risk of complications and mortality in the short term

Endovascular devices have undergone significant refinements and improvements that have significantly expanded their criteria of adequacy

Objectives

- Describe the situation in Catalonia in relation to the choice of the surgical procedure for abdominal aortic aneurysm repair
- Identify the **factors that determine the choice** of the surgical procedure for AAA
- Assess the effect of **differences in clinical practice**
- Improving information for the adoption of the **most appropriate procedure**

Univariate descriptive analysis of abdominal aortic aneurysm repair (2010-2013)

	values
Discharges (2010-2013)	1.948
% females	3,6 %
Age (mean; median; rank)	72,1; 73; (36 – 92)
Charlson (mean; median; rank)	1,93; 2; (1 – 10)
% emergency admissions	18,1%
% rupture	11,4%
% EVAR	61,5%
% EVAR (Charlson 1)	55,1%
Hospital mortality	9,6%
Hospital mortality (no rupture)	4,1%

Source: Hospital Minimum Data Set, 2010-2013

Bivariate descriptive analysis of abdominal aortic aneurysm repair (2010-2013) by hospital

	H1	H2	H3	H4	H5	H6	H7	H8	Total
discharges	174	181	180	175	270	143	133	124	1.948
females (%)	4	4	4	1	3	6	3	2	4
age (median)	74	72	72	71	73	73	73	74,5	73
Charlson (mean)	1,9	1,7	2,3	1,8	2	1,8	1,9	2,2	1,9
emergency adm. (%)	21	10	28	22	17	39	14	23	18
rupture (%)	13	6	18	13	9	26	9	12	11
EVAR (%)	26	64	56	63	62	50	88	81	62
EVAR in Charlson=1 (%)	24	67	39	59	46	40	83	74	55
Hospital mortality (no rupture) (%)	8	2	3	2	2	10	2	1	4

>20% above average
>20% below average

Source: Hospital Minimum Data Set, 2010-2013
Hospitals included: Number of cases (2010-2013)≥100

Factors that determine the choice of the surgical procedure for AAA

Material and methods

- Source: Hospital Minimum Data Set
- Period: 2010-2013. During this period hospitals have not changed significantly their procedure choice
- Hospitals included: Number of cases (2010-2013)≥100
- Cases with rupture are excluded. In case of rupture open surgery is often the only possible procedure
- Variables: Sex, age, admission (emergency o elective), Charlson index, hospital
- Analysis: Binary logistic regression
- Discharges: 1.207

Factors that determine the choice of the surgical procedure

Results

Probability of EVAR

	EVAR		OR			OR(adjusted)		
	N	%	ORc	$CI_{95\%}$	sign.	ORa	$CI_{95\%}$	sign.
Sex								
Male	744	63%	1					
Female	22	63%	0,97	(0,48-1,95)	ns			
Age								
<68 years	150	45%	1			1		
68-77 years	335	63%	2,13	(1,61-2,81)	**	2,09	(1,54-2,84)	**
>77 years	281	83%	6,04	(4,23-8,61)	**	8,56	(5,72-12,82)	**
Admission								
Elective	59	65%	1			1		
Emergency	707	47%	0,47	(0,32-0,67)	**	0,37	(0,24-0,56)	**
Charlson								
Charlson = 1	299	57%	1			1		
Charlson = 2	232	65%	1,44	(1,09-1,91)	**	1,52	(1,10-2,09)	**
Charlson ≥ 3	235	73%	2,02	(1,50-2,73)	**	2,14	(1,51-3,03)	*
Hospital								
H1	45	30%	1			1		
H2	114	67%	4,76	(2,97-7,62)	**	6,55	(3,89-11,03)	**
H3	87	59%	3,39	(2,10-5,47)	**	4,45	(2,63-7,65)	**
H4	100	65%	4,49	(2,77-7,26)	**	6,92	(4,05-11,82)	**
H5	155	63%	4,01	(2,60-6,18)	**	5,12	(3,17-8,28)	**
H6	62	58%	3,35	(1,99-5,64)	**	4,89	(2,74-8,73)	**
H7	113	93%	33,59	15,13-74,53)	**	57,78	4,95-133,82)	**
H8	90	63%	11,26	(6,15-20,63)	**	16,1	(8,28-31,32)	**

Factors that determine the choice of the surgical procedure

- Higher probability of EVAR in population older or with comorbidity and in elective admission cases

- However, the influence of the center is very important. The analysis shows three patterns:
  - Centre H1: low percentage of EVAR
  - Centres H2-H6: coexistance of EVAR and open surgery with predominance of EVAR
  - Centres H7-H8: high percentage of EVAR

The analysis shows the existance of **differences in clinical practice**

Effect on mortality of the differences in clinical practice

Material and methods

- Sources: Hospital Minimum Data Set and Central Register of Publicly Insured of Catalonia (CRI). The CRI has been used to assess the mortality.

- Period: 2010-2013. Patients monitored during 2 years.

- Hospitals included: Number of cases (2010-2013)≥100

- Cases with rupture are excluded

- Analysis (effect of the center): Mortality rate observed/expected by center (hospital mortality, 6-months mortality, one year mortality and two years mortality). Mortality expected estimated by binary logistic regression

- Variables: sex, age, admission (emergency o elective), Charlson index, procedure (to estimate if the effect of mortality is caused by the choice of the procedure or by other factors related with the centre)

- Patients: 1.186

Effect on mortality of the differences in clinical practice

Not adjusted by procedure

Hospital	Hospital mortality		6-months mortality		a year mortality		2 years mortality	
	Obs/Exp	CI 95%	Obs/Exp	CI 95%	Obs/Exp	CI 95%	Obs/Exp	CI 95%
H1	2,13	(1,32-2,94)	1,63	(1,03-2,24)	1,37	(0,86-1,89)	1,21	(0,79-1,63)
H2	0,82	(0,00-1,69)	0,79	(0,15-1,44)	0,8	(0,27-1,34)	0,87	(0,44-1,30)
H3	0,63	(0,00-1,39)	0,68	(0,09-1,27)	0,81	(0,30-1,32)	0,92	(0,51-1,33)
H4	0,58	(0,00-1,43)	1,04	(0,39-1,69)	1	(0,46-1,55)	0,87	(0,43-1,31)
H5	0,72	(0,05-1,39)	0,68	(0,19-1,18)	0,93	(0,52-1,35)	1,06	(0,72-1,39)
H6	2,22	(1,36-3,08)	2,3	(1,62-2,97)	1,9	(1,31-2,49)	1,54	(1,04-2,03)
H7	0,61	(0,00-1,67)	0,85	(0,06-1,64)	1,04	(0,40-1,69)	0,83	(0,32-1,34)
H8	0,23	(0,00-1,14)	0,25	(0,00-0,91)	0,28	(0,00-0,84)	0,71	(0,25-1,16)

Adjusted by procedure

Hospital	Hospital mortality		6-months mortality		a year mortality		2 years mortality	
	Obs/Exp	CI 95%	Obs/Exp	CI 95%	Obs/Exp	CI 95%	Obs/Exp	CI 95%
H1	1,25	(0,64-1,86)	1,27	(0,75-1,80)	1,23	(0,74-1,72)	1,12	(0,72-1,52)
H2	0,77	(0,00-1,62)	0,78	(0,14-1,41)	0,8	(0,27-1,33)	0,87	(0,44-1,30)
H3	0,6	(0,00-1,34)	0,67	(0,09-1,25)	0,81	(0,30-1,31)	0,92	(0,50-1,33)
H4	0,66	(0,00-1,57)	1,09	(0,43-1,76)	1,02	(0,47-1,57)	0,88	(0,43-1,32)
H5	0,77	(0,08-1,46)	0,69	(0,19-1,20)	0,93	(0,52-1,35)	1,06	(0,73-1,39)
H6	2,53	(1,61-3,45)	2,39	(1,70-3,08)	1,92	(1,33-2,52)	1,55	(1,05-2,04)
H7	1,17	(0,00-2,65)	1,08	(0,19-1,97)	1,14	(0,47-1,82)	0,88	(0,36-1,41)
H8	0,32	(0,00-1,41)	0,28	(0,00-0,98)	0,29	(0,00-0,87)	0,73	(0,26-1,19)

Effect on mortality of the differences in clinical practice

- The center H1 (low percentage of EVAR) presents a higher mortality in the short term (6 months).
- The higher mortality in H1 is related to the procedure choice. The effect disappears if procedure is included into the model
- The center H6 presents a higher mortality, not related to the procedure, which remains two years after the intervention
- The center H8 presents a lower mortality, not related to the procedure, which remains one year after the intervention

Differences in clinical practice have an effect in short term mortality (6 months)

The surgical procedure affects to the long term mortality?

	hospital mortality			6-months mortality			a year mortality			2 years mortality		
	ORa	CI 95%	sign.	ORa	CI 95%	sign.	ORa	CI 95%	sign.	ORa	CI 95%	sign.
Sex												
Male	1			1						1		
Female	3,21	(0,95-10,78)	ns	2,28	(0,79-6,63)	ns				2,39	(1,06-5,41)	*
Age												
<68 years	1			1			1			1		
68-77 years	1,34	(0,58-3,11)	ns	1,67	(0,82-3,43)	ns	1,85	(1,01-3,40)	*	1,61	(0,98-2,65)	ns
>77 years	3,26	(1,35-7,92)	**	3,97	(1,91-8,24)	**	2,97	(1,57-5,61)	**	2,73	(1,62-4,60)	**
Admission												
Programed	1			1			1			1		
Urgent	4,26	(2,14-8,48)	**	3,72	(2,11-6,57)	**	2,83	(1,67-4,81)	**	1,78	(1,07-2,96)	*
Charlson												
Charlson = 1	1			1			1			1		
Charlson = 2	1,2	(0,51-2,78)	ns	0,99	(0,52-1,88)	ns	1,02	(0,59-1,75)	ns	1,07	(0,68-1,69)	ns
Charlson ≥ 3	2,22	(1,05-4,68)	*	1,79	(1,01-3,16)	*	1,82	(1,12-2,96)	*	1,99	(1,31-3,01)	**
Procedure												
EVAR	1			1			1			1		
Open surgery	5,21	(2,50-10,85)	**	1,93	(1,13-3,31)	*	1,26	(0,79-2,02)	ns	1,16	(0,78-1,73)	ns

- The patient's age and the degree of comorbidity are related with short term and long term mortality, as well as the type of admission
- Surgical procedure is not associated with long term mortality

Limitations

- Other factors could be influencing the relations we have explored, for example, the existence of previous abdominal surgery.
- Insufficient number of cases to analyze some associations, such as mortality or rupture in women or patients profiles
- The use of Charlson index involves two limitations:
  - Charlson weights were calculated at the end of 80s. The probability of survival of some diseases included in it has changed considerably since then
  - It is not a specific index to measure the severity of patients with abdominal aortic aneurysm

Conclusions

- Age and comorbidity increase the probability of EVAR, but centre is the variable with most influence on the procedure election

  The analysis shows three patterns:
  - Center H1: low percentage of EVAR
  - Centers H2-H6: coexistance of EVAR and open surgery with predominance of EVAR
  - Centres H7-H8: high percentage of EVAR

- The hospital mortality and 6-months mortality are strongly associated to the type of admission (emergency), age and degree of comorbidity. In the case of H1, the surgical procedure (open surgery) has an important influence.

- The center H8 presents lower mortality than expected at short and long term which is not associated with the procedure

- The center H6 presents higher mortality than expected at short and long term which is not associated with the procedure

- Only patient characteristics (age and comorbidity) and type of admission are significants to explain mortality in the long term

http://observatorisalut.gencat.cat

Previous analysis: Is rupture associated with other variables?

Probability of rupture

	rupture		OR			OR(adjusted)		
	N	%	OR	$CI_{95\%}$	sign.	ORa	$CI_{95\%}$	sign.
Sex								
Male	160	12%	1			1		
Female	13	27%	2,72	(1,41-15,25)	**	2,62	(1,32-5,22)	**
Age								
<68 years	44	12%	1			1		
68-77 years	87	14%	1,25	(0,85-1,85)	ns	1,37	(0,92-2,04)	ns
>77 years	42	11%	0,95	(0,61-1,49)	ns	0,98	(0,62-1,55)	ns
Charlson								
Charlson = 1	91	15%	1			1		
Charlson = 2	45	11%	0,73	(0,50-1,08)	ns	0,73	(0,49-1,09)	ns
Charlson ≥ 3	37	10%	0,66	(0,44-0,99)	*	0,6	(0,40-0,92)	*
Hospital								
H1	22	13%	1			1		
H2	10	6%	0,4	(0,18-0,88)	*	0,39	(0,18-0,86)	*
H3	32	18%	1,49	(0,83-2,69)	ns	1,68	(0,92-3,06)	ns
H4	22	13%	0,99	(0,53-1,87)	ns	1,02	(0,54-1,92)	ns
H5	23	9%	0,64	(0,35-1,19)	ns	0,67	(0,36-1,26)	ns
H6	37	26%	2,41	(1,35-4,32)	**	2,37	(1,31-4,27)	**
H7	12	9%	0,68	(0,33-1,44)	ns	0,68	(0,32-1,44)	ns
H8	15	12%	0,95	(0,47-1,92)	ns	1,04	(0,51-2,11)	ns

Which is the procedure recommended to each patient profile?

- Analysis (effect of the procedure) : Ratio mortality observed/expected by procedure and patient profile (hospital mortality and 6-months mortality). Mortality expected estimated by bivariate logistic regression
- Limitation: the number of cases is often insufficient to obtain conclusive results
- In population over 77, EVAR is recommended
- In the rest of groups, no significant differences are observed

Charlson	Age	hospital mortality				6-months mortality				Recommended
		open surgery		EVAR		open surgery		EVAR		
		Obs/Exp	CI 95%	Obs/Exp	CI 95%	Obs/Exp	CI 95%	Obs/Exp	CI 95%	
≤2	≤67 years	1,86	(0,93-2,79)	0	(0,00-1,00)	1,67	(0,79-2,55)	0,24	(0,00-1,17)	No significant differences
	68 a 77 years	1,34	(0,33-2,34)	0,7	(0,00-1,65)	1,06	(0,32-1,81)	0,95	(0,29-1,61)	No significant differences
	≥78 years	2,8	(1,37-4,23)	0,19	(0,00-0,60)	1,39	(0,40-2,37)	0,91	(0,45-1,38)	EVAR
>2	≤67 years	2,26	(0,20-4,31)	0	(0,00-1,83)	0,84	(0,00-2,06)	1,62	(0,00-4,09)	No significant differences
	68 a 77 years	1,97	(0,64-3,31)	0,6	(0,00-1,46)	2,06	(0,95-3,16)	0,62	(0,00-1,28)	No significant differences
	≥78 years	7,88	(5,47-10,30)	0,56	(0,00-1,26)	1,58	(0,59-2,57)	0,86	(0,35-1,37)	EVAR