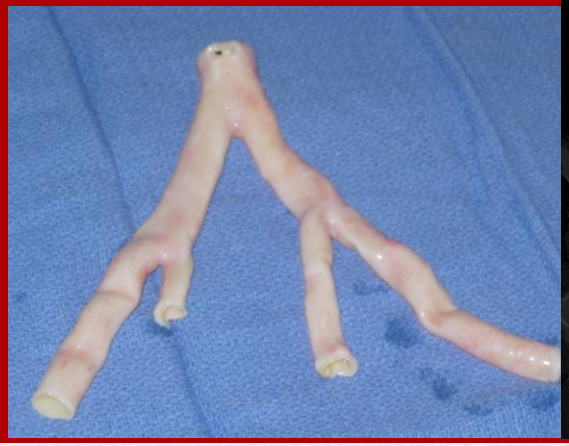

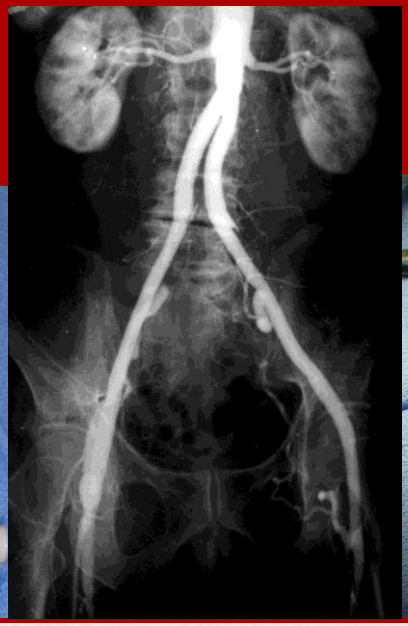

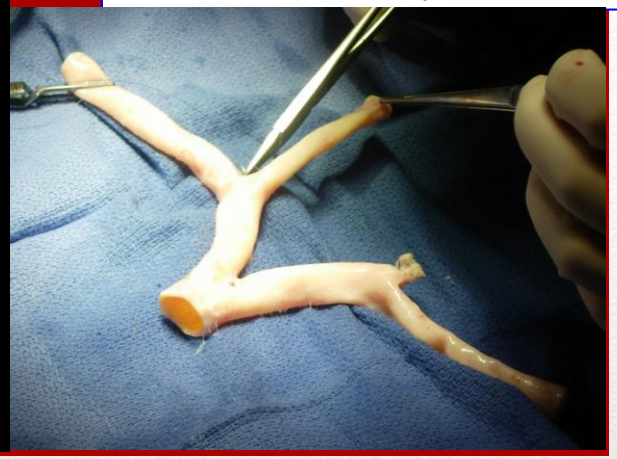

Forget it: cryopreserved allografts are the safest way

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In situ aortobifemoral bypass

Fresh allograft, multiorgan harvest, antibiotic medium

Imediate goal: bridge across the septic period

Death / cancer @ 4y, without vascular reintervention

1988: First case in Pitié-Salpêtrière Hospital

J Vasc Surg 1991;14:98-102

Disappointing results with conventionnal treatment (extraanatomic bypass)

. Secondary infection: 3% to 27%

. Primary patency @ 5y: 48% to 73%

. Limb salvage: 80% to 88%

. Aortic stump rupture: 3% to 20%

Rationale for the use of cryopreserved allografts

Allografts resistance to infection

Experimental evidence of allograft resistance to infection

. High antibiotic concentration in the wall of the allograft

. Anti adherential properties of endothelial cells present at the surface of cryopreserved allografts

Clinical evidence of allograft resistance to infection

. Encouraging results with valvular allograft replacement

. Encouraging results with venous allografts despite anatomical degradation

. Incomplete but relatively high resistance

Allografts resistance to infection

Main problems regarding reinfection:

. Highly virulent micro-organisms

. Persistent intraabdominal sepsis

. Aortoenteric fistula

. Incomplete removal of infected graft material

Allograft replacement for infrarenal aortic graft infection: Early and late results in 179 patients

Edouard Kieffer, MD, Dominique Gomes, MD, Laurent Chiche, MD, Marie-Hélène Fléron, MD, Fabien Koskas, MD, and Amine Bahnini, MD, *Paris, France*

Conclusions: Early and long-term results of allograft replacement are at least similar to those of other methods to manage infrarenal aortic graft infections. Rare specific complications include early or late allograft rupture and late aortic dilatation. The more frequent late iliofemoral complications may be easily managed through the groin. These complications are significantly reduced by using cryopreserved allografts rather than fresh allografts and by not using allografts obtained from the descending thoracic aorta. (J Vasc Surg 2004;39:1009-17.)

Pitié-Salpêtrière's experience

Postoperative mortality

36 pts (20.1%)

Sepsis N = 21		General N = 15	
Allograft rupture	4 *	Myocardial infarction	5
Aortic rupture	1	Pulmonary complications	4
Septic shock	12	MOF	2
Recurrent duodenal fistula without AEF	2	Intestinal ischemia	1
		Adrenal insufficiency	1
Coagulopathy	2	Acute pancreatitis	1

* Including 3 recurrent AEF

Fresh vs cryopreserved allografts

Complications	Global	FA	CA	p
Early mortality	20.1	24.3	13.2	0.07
Allograft related mortality	4.3	6.0	1.7	0.19
Allograft related complication	39.4	51.4	20.3	0.006

Demographics: 12/2002 – 07/2009 : 72 pts

Male	65 (90%)
Mean age	62.5 (40 - 86)
Primary infection	54 (75%)
Aorto-enteric fistula	18 (25%)
Referred patients	57 (79%)

Pitié-Salpêtrière's experience: SCV 2010

Interventions

Abdominal: 21 / + femoral: 51

CPB use : 4

Combined revascularizations: renal (6 pts), intestinal (5 pts), Internal Iliac (7 pts), Lower limb (5 pts)

Combined intestinal treatment / 18 FPD

Op. Duration: 344 ± 112 min

Postoperative mortality

9 pts (12.5%)

Allograft rupture	3 *
Myocardial infarction	1
Pulmonary complications	2
MOF(intestinal ischemia, 2)	3
(Septic shock from pulmonary causes, 1)	

* 3 after AEF; 2 operated under CPB

Early reinterventions: 19/63 sv

Allograft-related 6

Iliac allograft rupture(wo AEF): *3 d9, 15, 27*

Global rupture rate: 6

. Op. duration p : 0.0008

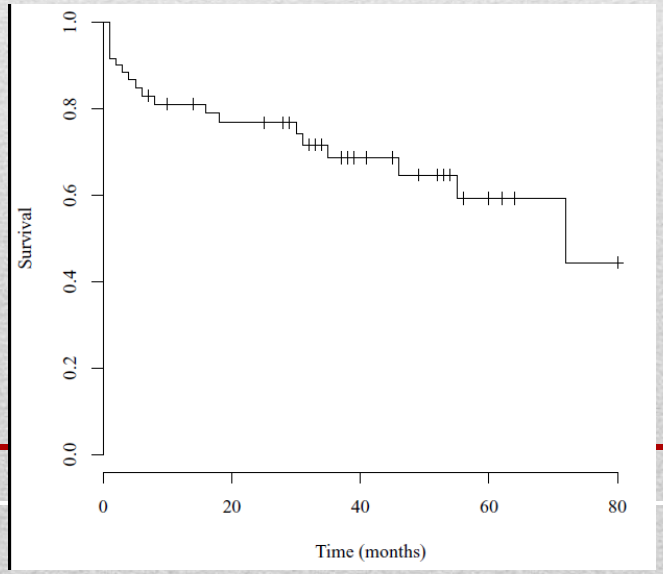
. CPB p : 0.03

. Pseudomonas aeruginosa p : 0.03

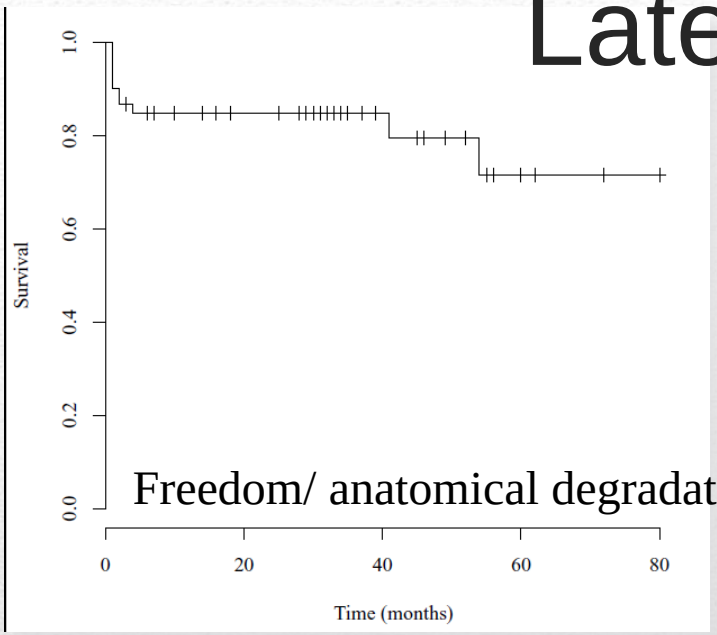
Iliac allograft thrombosis: *3 j1, 15, 19*

Late death
11 pts (17.4%)

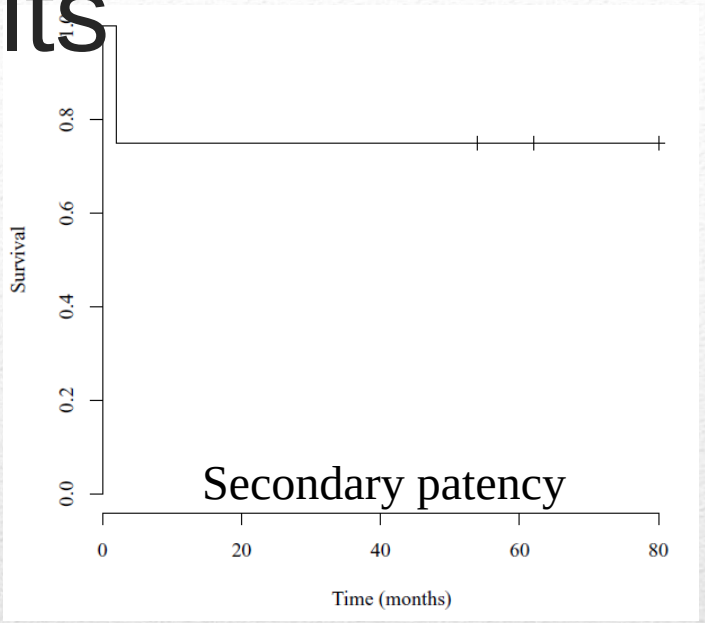
Allograft-related N = 1		Non allograft-related N = 10	
Intestinal bleeding	(1.5%)	Cancer	2
		MI	2
		Cachexia	5
		Renal Failure	1



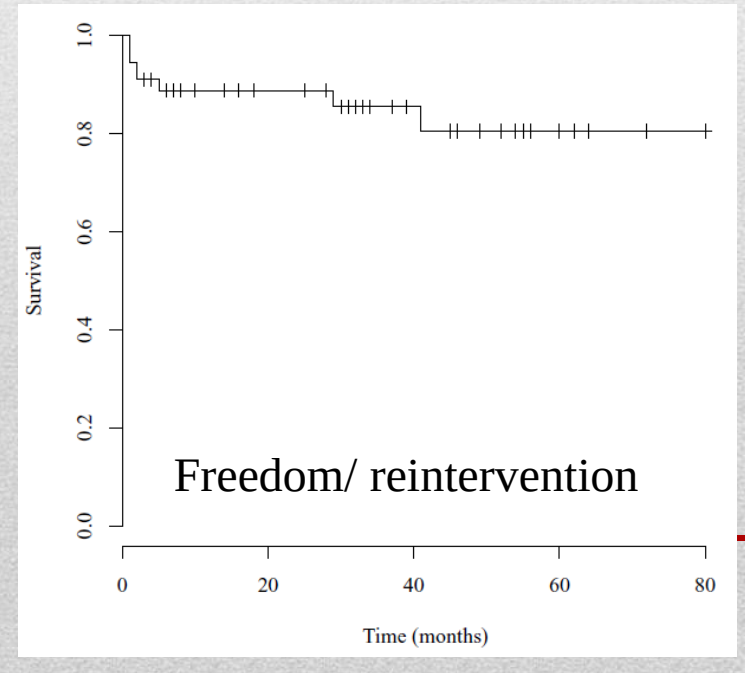
Late results



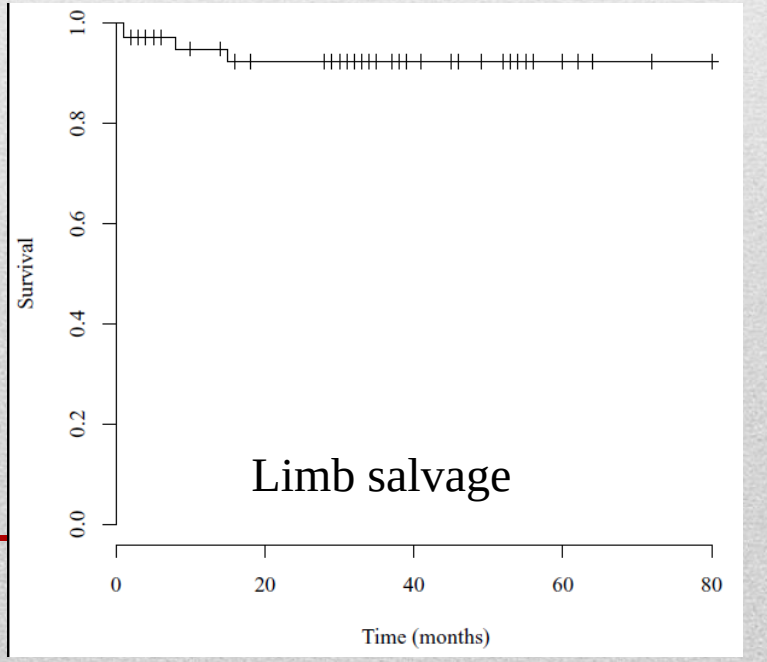
Freedom/ anatomical degradation



Secondary patency



Freedom/ reintervention



Limb salvage

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World Journal of Surgery

ORIGINAL SCIENTIFIC REPORT

Surgery for Secondary Aorto-Enteric Fistula or Erosion (SAEFE) Complicating Aortic Graft Replacement: A Retrospective Analysis of 32 Patients with Particular Focus on Digestive Management

Thibaut Schoell · Gilles Manceau · Laurent Chiche · Julien Gaudric · Hadrien Gibert · Christophe Tresallet · Laurent Hannoun · Jean-Christophe Vaillant · Fabien Koskas · Mehdi Karoui

Study (year)	*n*	Study period (study type)	Follow-up, months	Vascular surgical technique	EF location	Postoperative mortality (%)	Postoperative morbidity (%)	Reoperation rate (%)	Recurrence of AEF (%)
Lavigne et al. (2003) [29]	4	1994–1997 (monocentric)	–	Cryopreserved allograft	NM	50	NM	25	25
Ali et al. (2009) [19]	26	1990–2006 (multicentric)	32[a] (12–168)	Autogenous femoropoplitea vein	D	31	NM	NM	19
Biro et al. (2011) [30]	38	1989–2009 (monocentric)	48.6[b]	Silver-impregnated prosthesis; Dacron graft; cryopreserved allograft; deep femoral vein	D	46	NM	NM	NM
Oderich et al. (2011) [18]	54	1990–2008 (monocentric)	51[b] (3–197)	Rifampin-soaked grafts	D; SB	9	52	20	0
Batt et al. (2011) [11]	37	2000–2008 (multicentric)	41[b] (3–101)	Silver-coated prosthesis; cryopreserved allograft; rifampin-bonded prosthesis; autogenous vein	D; SB; CO	48	59	NM	27
Present series	32	2002–2012 (monocentric)	31[a] (1–114)	Cryopreserved allograft	D; SB; CO; G	25	62.5	21	9

Arterial reconstruction with cryopreserved human allografts in the setting of infection: A single-center experience with midterm follow-up

Katherine E. Brown, DO, Kamaldeep Heyer, MD, Heron Rodriguez, MD, Mark K. Eskandari, MD, William H. Pearce, MD, and Mark D. Morasch, MD, *Chicago, Ill*

Objectives: Vascular reconstruction in the setting of primary arterial or prosthetic graft infection is associated with significant morbidity and mortality. Cryopreserved human allografts (CHA) may serve as acceptable alternatives when autogenous or extra-anatomic/in situ prosthetic reconstructions are not possible.

Methods: Between February 1999 and June 2008, 57 CHAs were placed in 52 patients (average age, 65 years) for abdominal aortic (n = 18) or iliofemoral/femoral-popliteal arterial or prosthetic infections (n = 39). Indications for arterial reconstruction included infected implanted prosthetic material (n = 39), mycotic pseudoaneurysms (n = 14), or intra-abdominal bacterial contamination or wound infection (n = 4). Wide local debridement and culture was followed by allograft interposition, bypass, or extra-anatomic reconstruction. Over a similar time period, 53 non-CHA extra-anatomical prosthetic or in situ autogenous tissue reconstructions were performed in 53 patients (average age, 65 years) for abdominal aortic (n = 18) or iliofemoral and femoral-popliteal (n = 35) prosthetic graft infections. Indications for arterial replacement in all cases included infected implanted prosthetic material.

Results: Thirty-day mortality for all CHA and non-CHA reconstructions was 5.2% and 7.5%, respectively. The 1-year procedure-related mortality for all CHA and non-CHA procedures was 7.0% and 13.2%, respectively. In the CHA cohort, 5 patients required re-exploration for hemorrhage or anastomotic disruption. In midterm CHA follow-up (20 months), there was 1 graft thrombosis, 2 graft stenoses, 1 recurrent ilioenteric fistula, and 1 non-related amputation. The remainder of the CHA reconstructions remained patent without evidence of aneurysmal change or reinfection.

Conclusion: In the setting of infection, cryopreserved human allograft arterial reconstruction is a viable alternative to traditional methods of vascular reconstruction in patients without available autogenous conduit and when expedient reconstruction is required. In midterm follow-up, cryopreserved allografts appear to be resistant to subsequent reinfection, thrombosis, or aneurysmal dilatation. However, larger patient populations and longer follow-up are needed to determine if arterial reconstruction with CHA is the safest and most durable method of treatment for arterial infections. (J Vasc Surg 2009;49:660-6.)

Eight-year experience with cryopreserved arterial homografts for the in situ reconstruction of abdominal aortic infections

Theodosios Bisdas, MD,[a] Martin Bredt, MD,[b] Maximilian Pichlmaier, MD,[a] Thomas Aper, MD,[a] Mathias Wilhelmi, MD,[a] Sotirios Bisdas, MD,[c] Axel Haverich, MD[a] and Omke E. Teebken, MD,[a] *Hannover and Tuebingen, Germany*

Objective: This study investigated short-term and long-term outcomes in patients with abdominal aortic infection (mycotic aneurysm, prosthetic graft infection, aortoenteric fistula) managed by total excision of the aneurysm or the infected vascular graft and in situ aortic reconstruction with a cryopreserved arterial homograft (CAH).

Methods: From January 2000 to December 2008, 110 consecutive patients underwent CAH implantation for treatment of vascular infections. In 57 (52%), in situ revascularization of the abdominal aorta with Y-prosthesis constructed from CAHs was performed. Early outcome included 30-day mortality and the levels of daily blood markers (leucocytes, C-reactive protein, and platelets) during the postsurgical 10-day period. We reported long-term survival and freedom from reoperation rates, including all indications for reoperation.

Results: Indications for operation were infected vascular graft in 31 patients (55%), aortodigestive fistulae in 11 (19%), nonruptured mycotic aneurysms in 4 (7%), and ruptured mycotic aneurysms of abdominal aorta in 11 (19%). In 39 of 57 patients (68%), the intraoperative specimens were positive for at least one microorganism, and *Staphylococcus aureus* was present in 14 (25%). In 32 patients (82%) with intraoperative specimens positive for microorganisms, there was no evidence of the intraoperatively detected microorganisms in the postoperative specimens (wound, blood culture, and drainage fluid). The peak value of leucocytes ($13.7 \pm 4.4 \times 10^3$/L) and C-reactive protein (200 ± 75 mg/L) occurred on postoperative day 3. Platelets reached the lowest value on postoperative day 2 ($178 \pm 67 \times 10^9$/L). Median peak body temperature was 37.7° ± 0.6°C. Thirty-day mortality was 9% (5 of 57 patients). Median follow-up was 36 months (range, 4-118 months); 3-year survival was 81%, and freedom from reoperation was 89%. Five patients (9%) required reoperation, in one patient each for postoperative bleeding, acute cholecystitis, homograft occlusion, homograft-duodenum fistula, and aneurysmal degeneration. No recurrence of infection was reported.

Conclusion: These results demonstrate an encouraging outcome after cryopreserved allograft implantation for the treatment of vascular infections in the abdominal aorta. The data represent a basis for future comparisons with other treatment modalities for vascular infections, including silver-coated prostheses and autogenous femoral veins. (J Vasc Surg 2010;52:323-30.)

The use of cryopreserved aortoiliac allograft for aortic reconstruction in the United States

Michael P. Harlander-Locke, BS,[a] Liv K. Harmon, MD,[a] Peter F. Lawrence, MD,[a] Gustavo S. Oderich, MD,[b] Robert A. McCready, MD,[c] Mark D. Morasch, MD,[d] and Robert J. Feezor, MD,[e] for The Vascular Low-Frequency Disease Consortium, *Los Angeles, Calif; Rochester, Minn; Indianapolis, Ind; Billings, Mont; and Gainesville, Fla*

Background: Aortic infections, even with treatment, have a high mortality and risk of recurrent infection and limb loss. Cryopreserved aortoiliac allograft (CAA) has been proposed for aortic reconstruction to improve outcomes in this high-risk population.

Methods: A multicenter study using a standardized database was performed at 14 of the 20 highest volume institutions that used CAA for aortic reconstruction in the setting of infection or those at high risk for prosthetic graft infection.

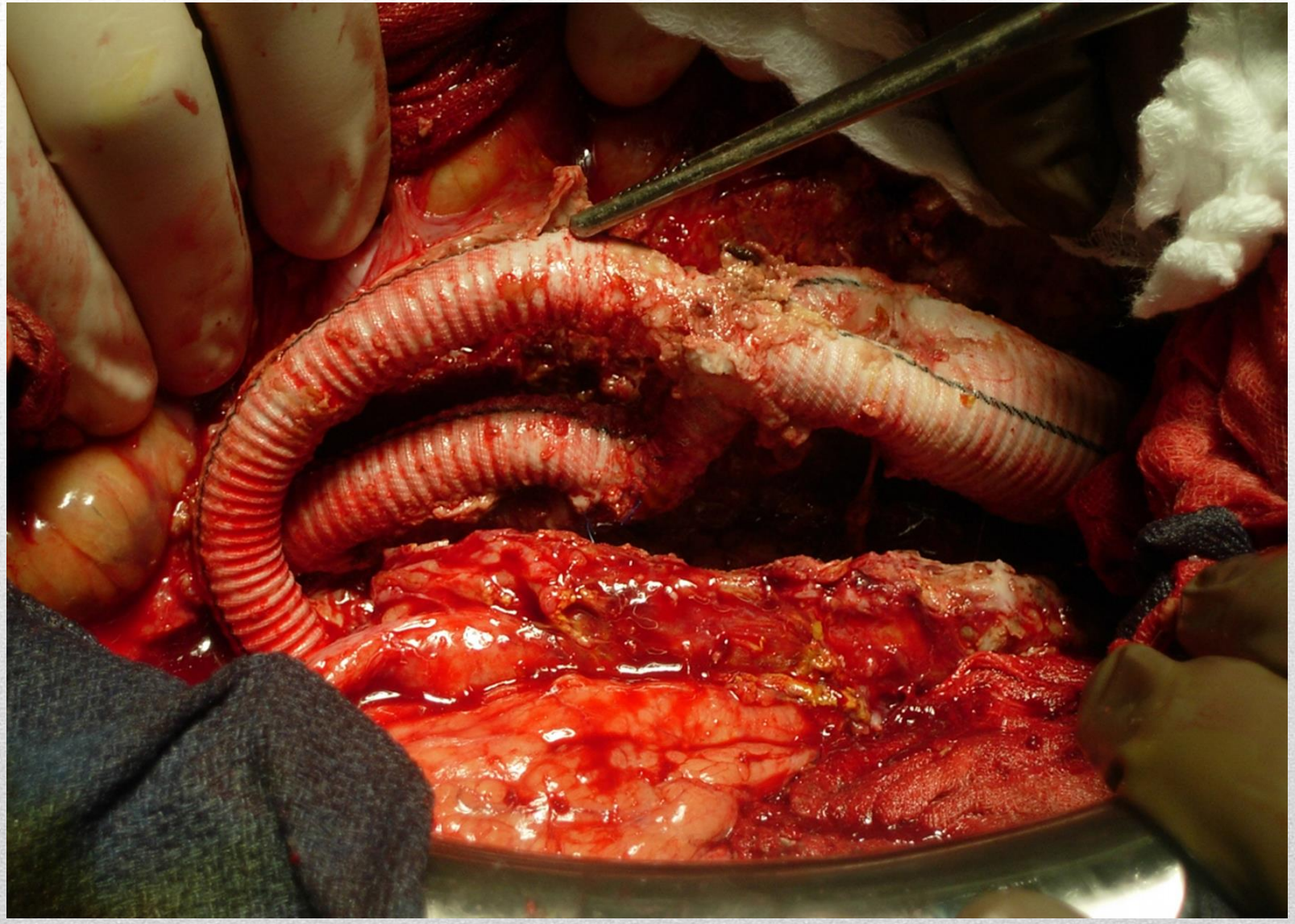
Results: Two hundred twenty patients (mean age, 65; male:female, 1.6/1) were treated since 2002 for culture positive aortic graft infection (60%), culture negative aortic graft infection (16%), enteric fistula/erosion (15%), infected pseudoaneurysm adjacent to the aortic graft (4%), and other (4%). Intraop cultures indicated infection in 66%. Distal anastomosis was to the femoral artery and iliac. Mean hospital length of stay was 24 days, and 30-day mortality was 9%. Complications occurred in 24% and included persistent sepsis (n = 17), CAA thrombosis (n = 9), CAA rupture (n = 8), recurrent CAA/aortic infection (n = 8), CAA pseudoaneurysm (n = 6), recurrence of aortoenteric fistula (n = 4), and compartment syndrome (n = 1). Patients with full graft excision had significantly better outcomes. Ten (5%) patients required allograft explant. Mean follow-up was 30 ± 3 months. Freedom from graft-related complications, graft explant, and limb loss was 80%, 88%, and 97%, respectively, at 5 years. Primary graft patency was 97% at 5 years, and patient survival was 75% at 1 year and 51% at 5 years.

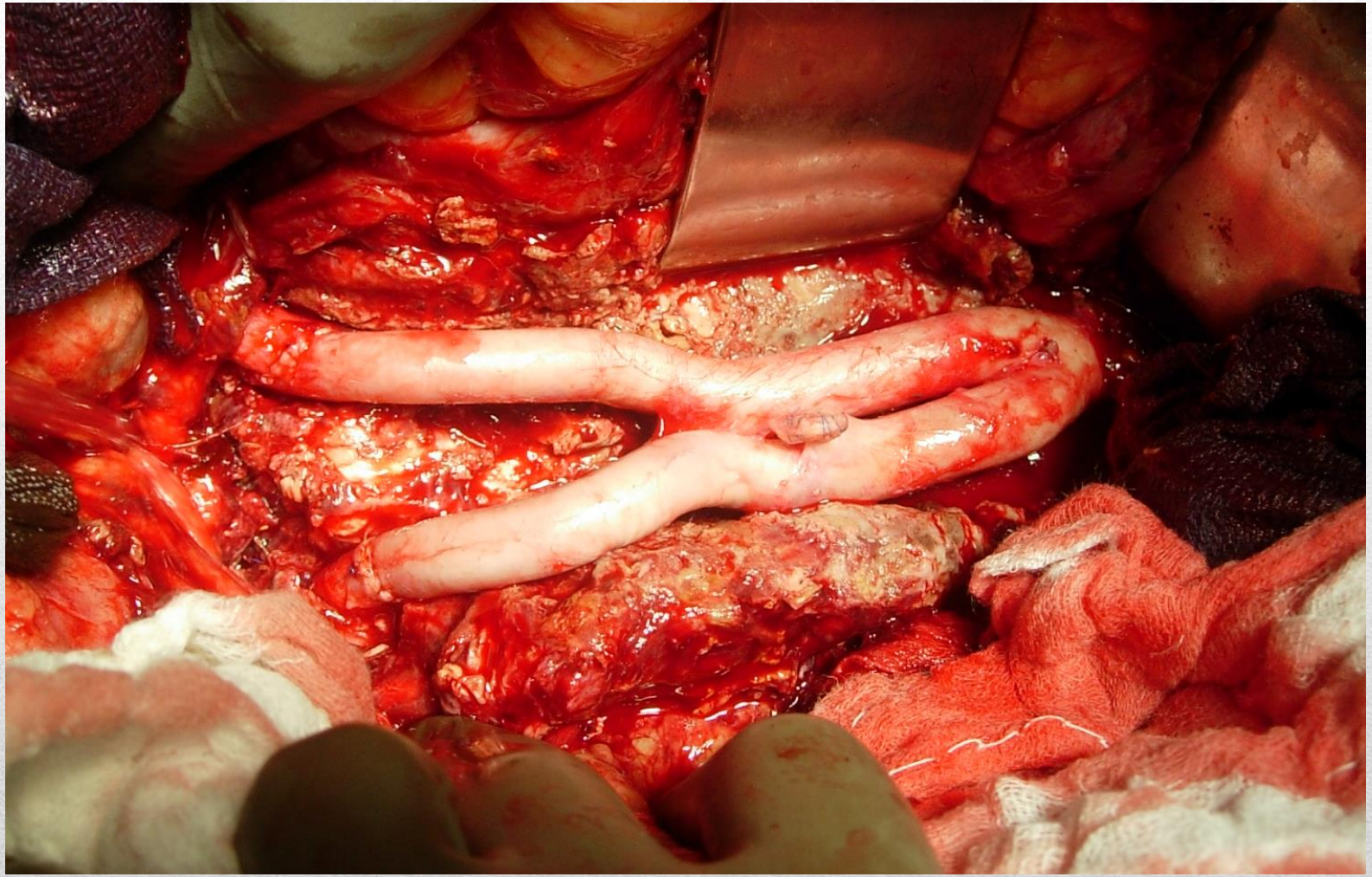
Conclusions: This largest study of CAA indicates that CAA allows aortic reconstruction in the setting of infection or those at high risk for infection with lower early and long-term morbidity and mortality than other previously reported treatment options. Repair with CAA is associated with low rates of aneurysm formation, recurrent infection, aortic blowout, and limb loss. We believe that CAA should be considered a first line treatment of aortic infections. (J Vasc Surg 2014;59:669-74.)

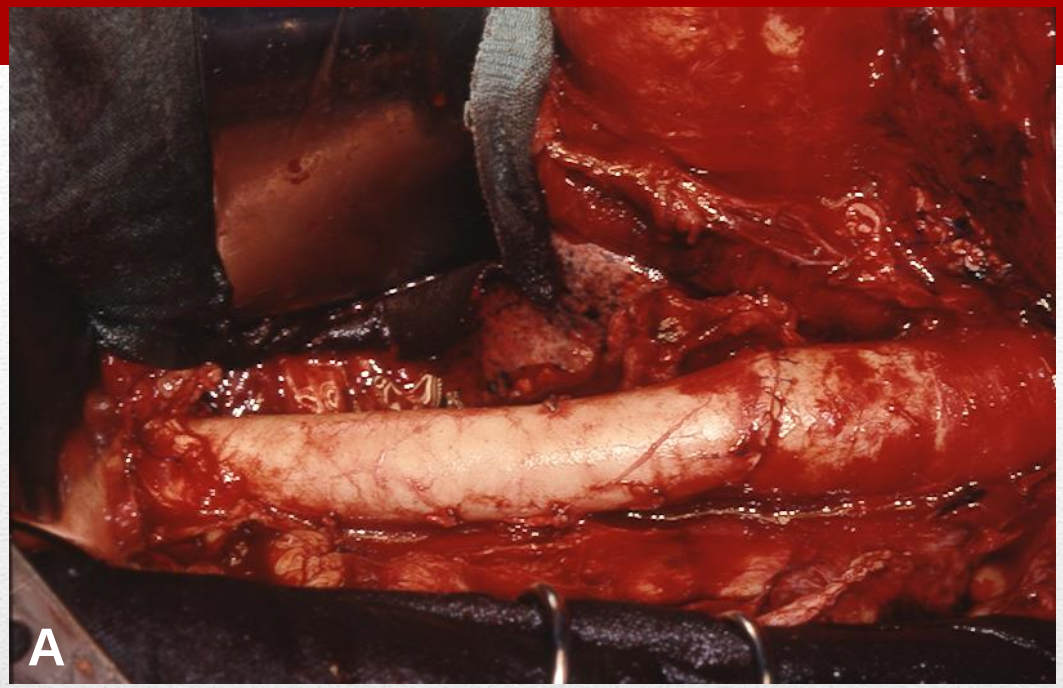
	Early deaths	Surival	Primary patency	Reinfection rate	Limb salvage	% AEF	FU mo	N pts
Harlander-Locke et al. *JVS 2014*	9% (30 d)	75% (1 y) ; 51% (5 y)	97% (5 y)	4,00%	98% (1 y) ; 93% (5 y)	15,00%	30	220
Kieffer et al. *JVS 2004*	20,1% (hosp)	73,2% (1 y) ; 55% (5 y)	NS	1,40%	99,5	30,20%	46,0	179 (68 cryo)
Pitié 2002 – 2009 *SCV 2010*	12,5% (hosp)	72% (3 y) ; 60% (5 y)	92,00%	3,20%	93,0	25,00%		72
Chiesa et al. *Acta Chir Belg 2002*	16% (30d)	57% (3 y)	NS	NS	95,6	32,35%	30	68 (57 cryo)
Bisdas et al. *JVS 2010*	9% (30 d)	81% (3 y) ; 64 % (5 y)	98,25%	0,00%	100,0	19,00%	36	57
Touma et al. *ESVS 2014*	28% (30d) ; 33% (hosp)		95%	5,10%	97,00%	13,00%	19,8	54
Gabriel et al. *EJVES 2004*	15% (30dj)	82% (3 y)	84% (3 y)	6,00%	92,3	10,25%	30-78	39
Garot et al. *BMC infectious disease 2014*	48% (hosp)	52% (1 y)	NS	0,00%	NS	16,00%	12	25
Leseche et al. *JVS 2001*	17,8%	78% (1 y) ; 67% (3 y)	81% (3 y)	0,00%	100,0	25,00%	35,4	28
Brown et al. *JVS 2009*	11,1% (30 d)		100,00%	5,55%	100,0	11,70%	25	18

Conclusions

- Cryopreserved allografts are certainly the safest way to deal with aortic prosthetic infection
- AEFs remain the most challenging cases
- Clinical short and long-term efficiency should be demonstrated for newest polyester grafts
- Newest graft might however be considered as a bridging solution when allografts are not available



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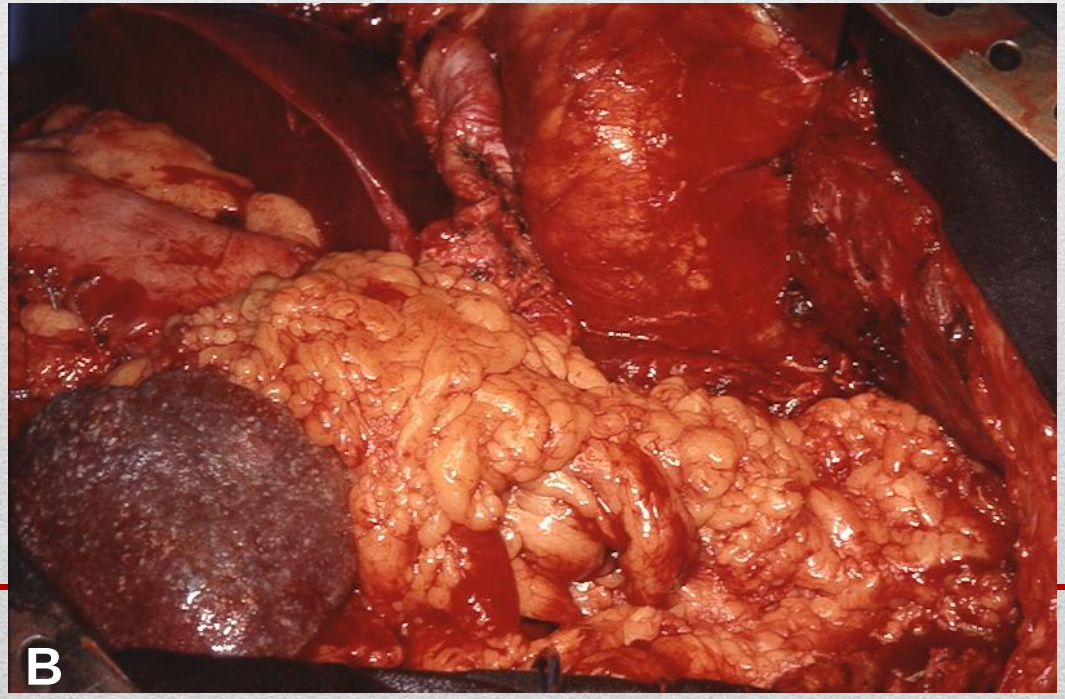
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