



The dark side of the guidelines

1<sup>st</sup> Interventional Radiologist under 40 Meeting

*Emergencies in Interventional Radiology*



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Bologna

Società Medica Chirurgica - Palazzo dell'Archiginnasio

# Urgenze aorto-iliache

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# Urgenze aorto-iliache

Rottura dilatazione  
aneurismatica

Complicanze post-  
procedurali (precoci/tardive)

Patologia traumatica

# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

❖ Dilatazione irreversibile dell'aorta addominale (incremento di almeno il 50% del suo diametro normale); >>> distretto sottorenale

❖ Principali fattori predittivi positivi

- \* Diametro della sacca aneurismatica
  - \* calibro compreso tra 4,0 e 4,9 cm  
rischio di rottura dell'1%/anno
  - \* calibro compreso tra 5,0 e 5,9 cm  
rischio di rottura dell'11%/anno
- \* Velocità di crescita ( \* 0.5 cm/anno)
- \* Morfologia della sacca aneurismatica
  - \* Fusiforme < Sacciforme



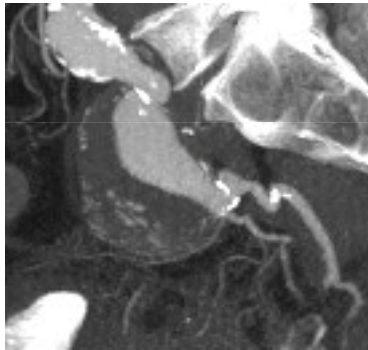
Rottura  
Complicanza più drammatica

❖ Causa di 6000 morti circa/anno in Italia; l'80% dei decessi avviene prima dell'arrivo del paziente in ospedale dove la mortalità degli interventi eseguiti in emergenza è del 40%

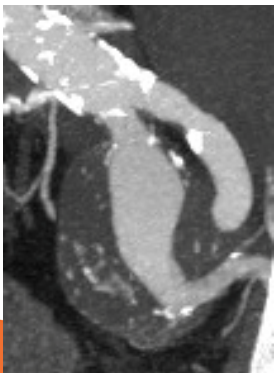
# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

- ❖ Dilatazione irreversibile dell'aorta addominale (incremento di almeno il 50% del suo diametro normale); >>> distretto sottorenale
- ❖ Possono estendersi distalmente a coinvolgere le arterie iliache



Arteria	Diametro Normale (cm)	Diametro Patologia Aneurismatica
Iliaca Comune	0.97-1.02 ± 0.15 (F)	≥1.5
	1.17-1.23 ± 0.2 (M)	≥1.7
Iliaca Interna	0.54 ± 0.15	≥0.8



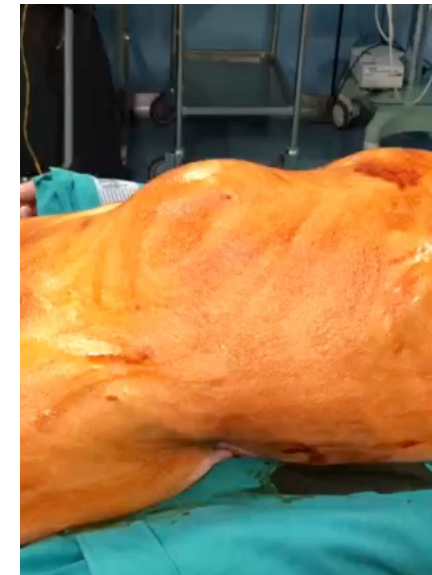
- \* Si associano ad AAA nel 10-20% dei casi
- \* Aneurismi iliaci isolati (AII): incidenza del 0.9-2% di tutta la patologia aneurismatica addominale
- \* 70% AII arteria iliaca comune; 20-25% AII arteria iliaca interna
- \* 30% AII bilaterali



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

- ❖ Dilatazione irreversibile dell'aorta addominale (incremento di almeno il 50% del suo diametro normale); >>> distretto sottorenale
- ❖ Possono estendersi distalmente a coinvolgere le arterie iliache
- ❖ Sintomatologia
  - \* Sintomi più o meno comuni a seconda della sede di rottura dell'aneurisma
  - \* Nel 20-25% dei casi: classica triade rappresentata da dolore addominale e/o dorsale, ipotensione, massa pulsante (rottura dell'aneurisma/rapido aumento dimensionale dell'aneurisma che comprime le strutture circostanti)
  - \* Sintomi dovuti alla trombosi dell'aneurisma senza/con embolizzazione distale



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ Ruolo dell'Imaging

#### ❖ Paziente in URGENZA

Paziente stabile ➡ ❖ Angio-TC

Paziente instabile ➡ ❖ Eco FAST/Angio-TC

Indicazioni  
Anatomiche



Scelta/Tipo di  
trattamento

# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ Ruolo dell'Imaging



- \* Aneurisma (sede, diametro assiale massimo, lesioni parietali)
- \* Colletto (calibro, morfologia, angolazione, lesioni parietali)
- \* Arterie iliache (calibro, lunghezza, decorso, lesioni parietali)
- \* Arterie iliache interne (pervietà, presenza di stenosi)
- \* Vasi viscerali (pervietà, stenosi TC, AMS, AMI)
- \* Vasi lombari



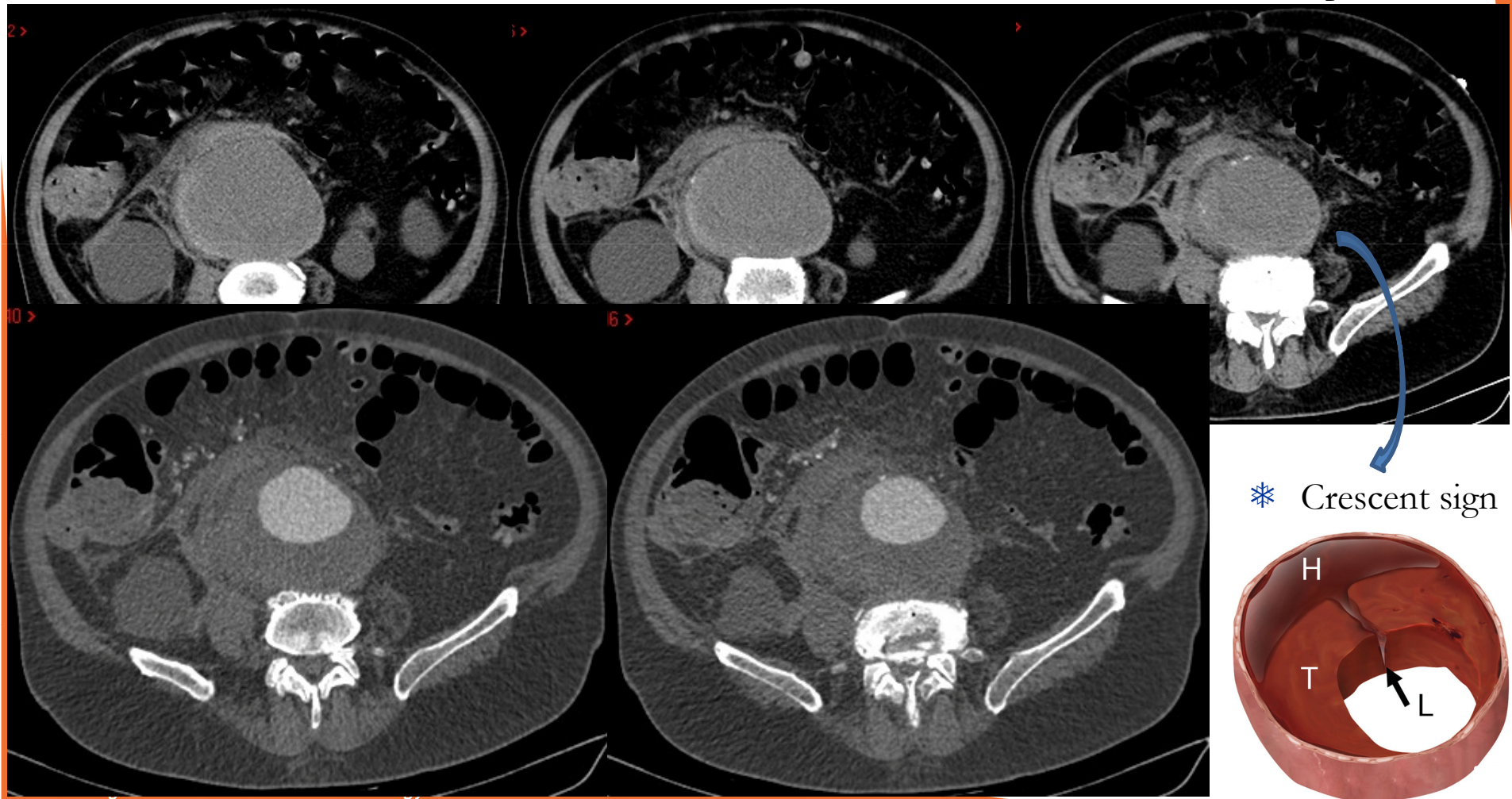
# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

❖ Ruolo dell'Imaging – Angio-TC

\* Periaortic stranding

\* Ematoma retro-intraperitoneale



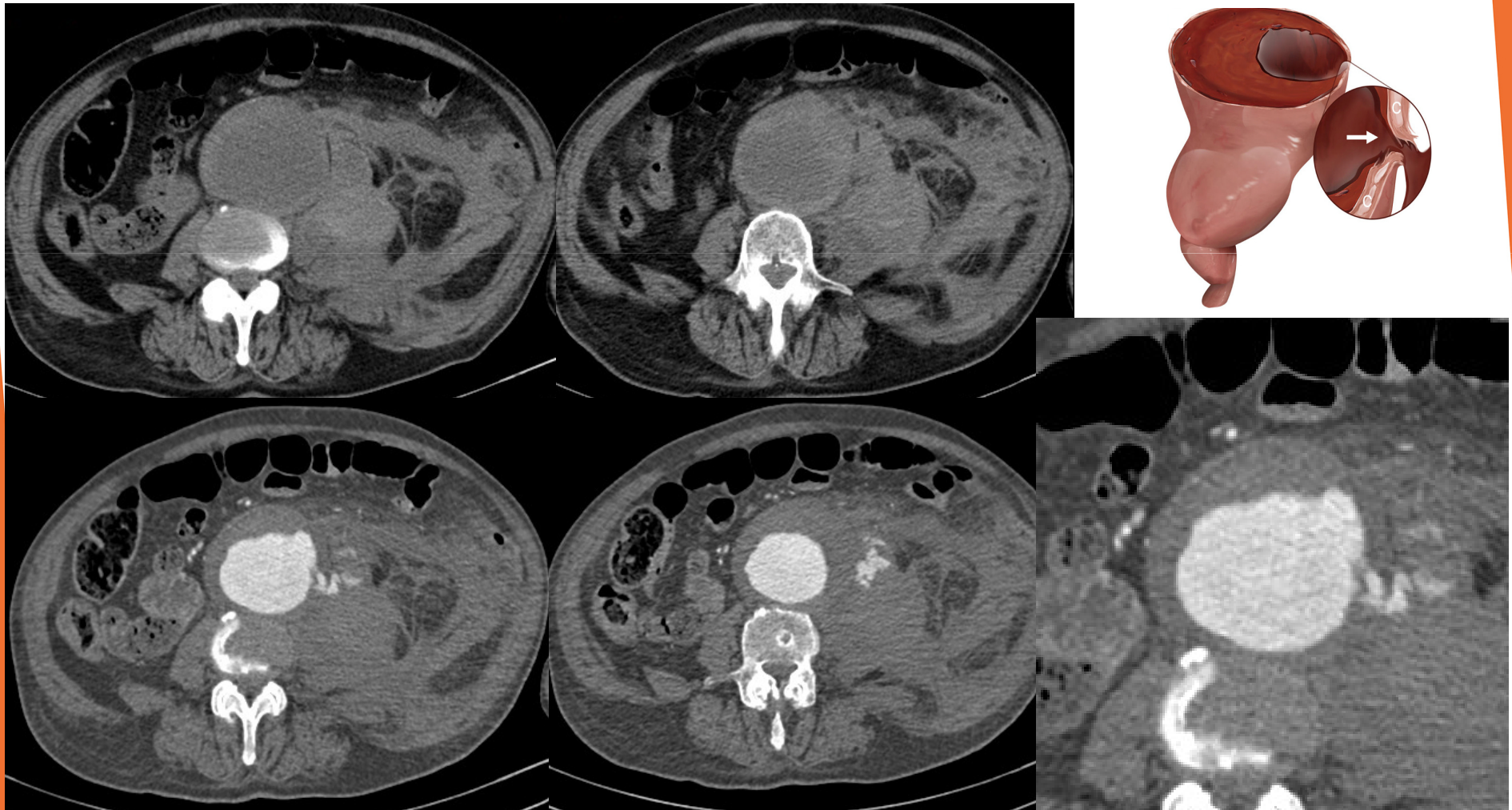


# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

❖ Ruolo dell'Imaging – Angio-TC

\* Stravasamento di mdc

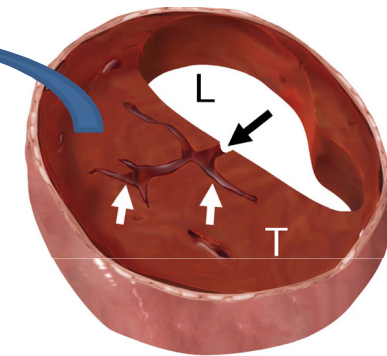
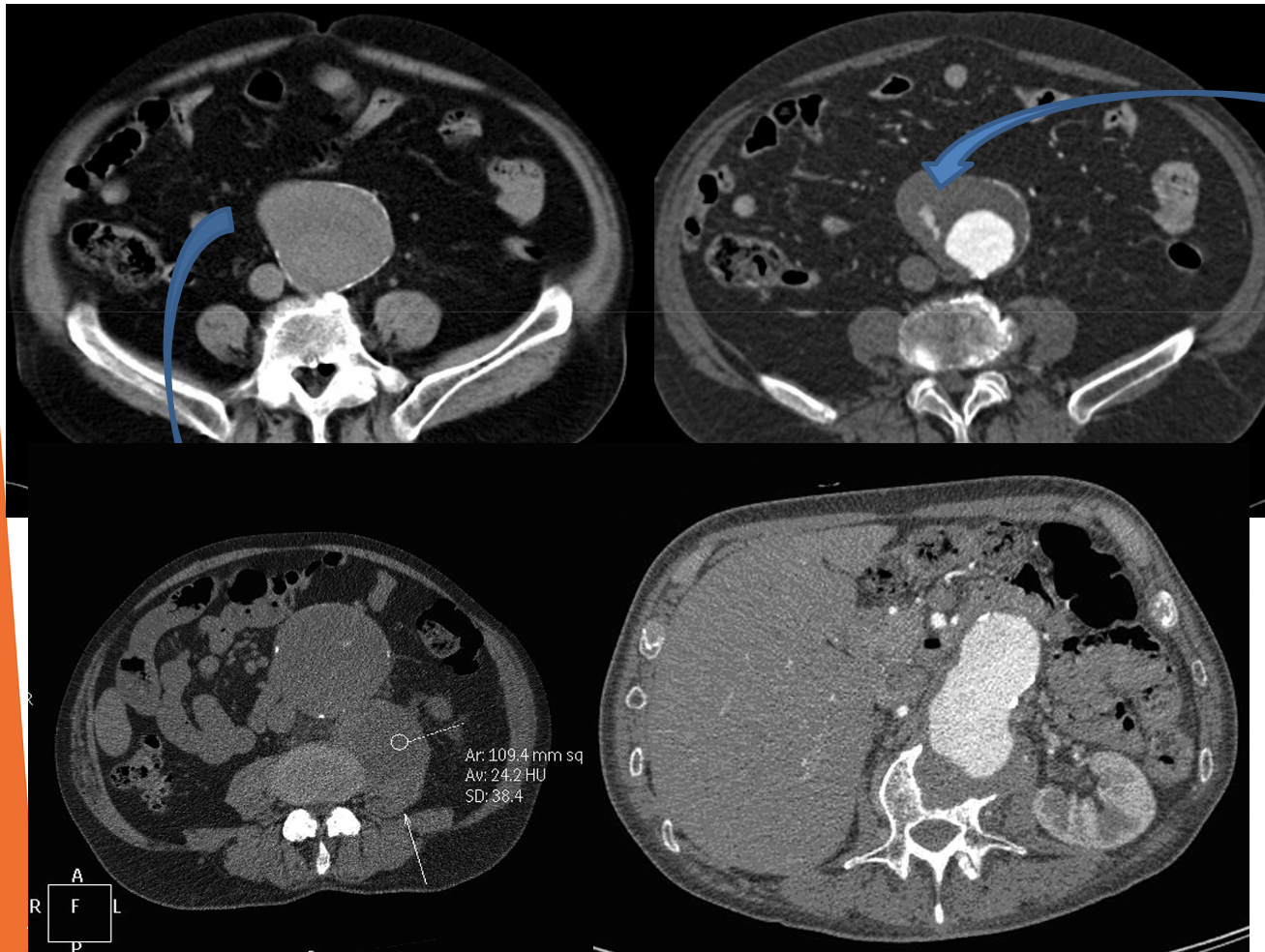


# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ Ruolo dell'Imaging – Angio-TC

\* Trombo fissurato



\* Draped sign

“Chronic contained rupture of the abdominal aorta: a known AAA, with symptoms that may have resolved, stable haemodynamic status with normal haemoglobin, and a CT examination that shows organized retroperitoneal haematoma”

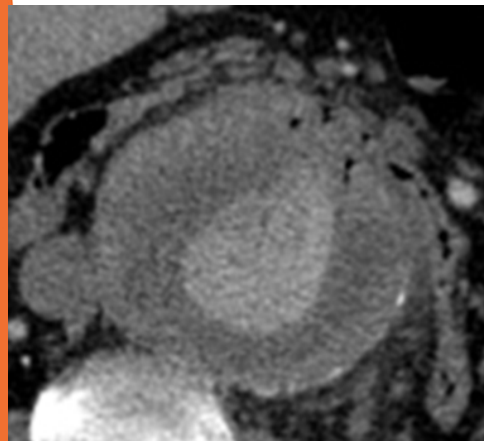
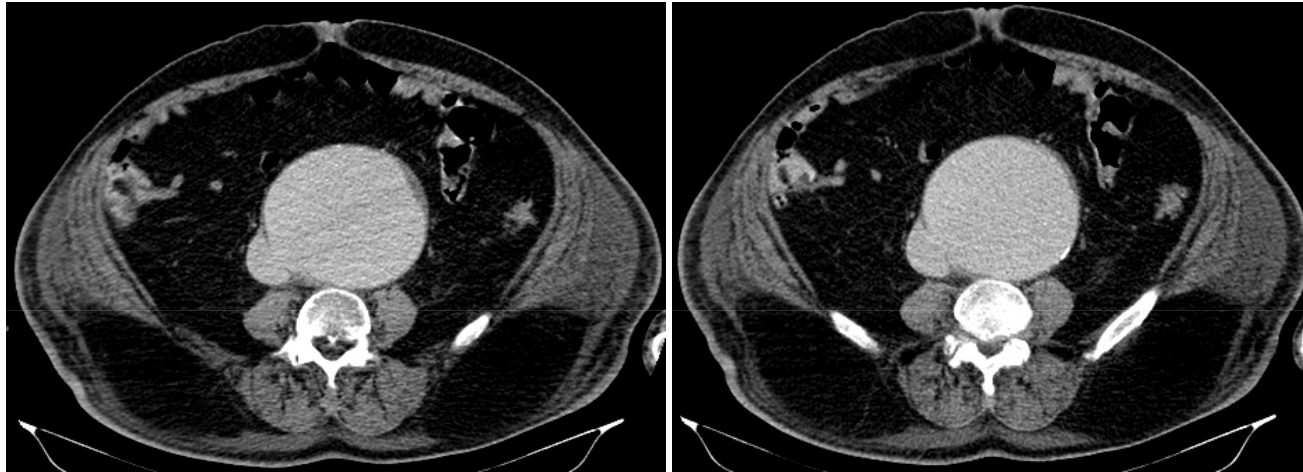


# Urgenze aorto-iliache

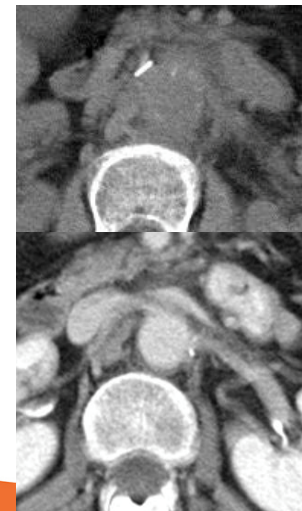
## Rottura dilatazione aneurismatica

❖ Ruolo dell'Imaging – Angio-TC

\* Fistola aorto-cavale



- \* Immagini a densità aerea
- \* Parete anteriore non riconoscibile ed indissociabile dalla III porzione duodenale



\* Fistola aorto-enterica

- \* Ansa duodenale con contenuto liquido iperdenso (40-60 UH)
- \* CE simile al lume aortico

# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ Management terapeutico



\* 87.5% dei pazienti che giunge in ospedale sopravvive >2h  
(ricovero <10.5h >decesso)

\* Emodinamicamente stabili per essere sottoposti ad Angio-TC

★ Trattamento garantito dalle  
4-24h dall'accesso in ospedale

★ Studio panoramico

★ Scelta della strategia  
terapeutica

\* Non emodinam stabili

★ Trattamento immediato mandatorio

\* Angio-TC ?????

★ Rapporto costo/beneficio



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ Management terapeutico

❄ Chirurgia “OPEN”: opzione terapeutica standard



“Despite important advances in technology and critical care, very little or no significant reduction in mortality rates in patients with open surgical repair of ruptured AAA has been noted in over 2 decades, remaining higher than 40 %”

❄ EndoVascular Abdominal Repair (EVAR):



Alternativa terapeutica



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ EVAR

Emergency endovascular repair of leaking aortic aneurysm

Yusuf S.W. et al. 1994 Dec 10;344(8937):1645

THE  
LANCET

“EVAR could be used in emergency situations, such as impending and even complete AAA ruptures”

★ Selezione del paziente in base alle caratteristiche anatomiche

★ Disponibilità del materiale  
(problema logistico ed economico)



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ EVAR

## Balloon Occlusion of the Aorta During Endovascular Repair of Ruptured Abdominal Aortic Aneurysm

Martin Malina, MD, PhD<sup>1</sup>; Frank Veith, MD<sup>2</sup>; Krasnodar Ivancev, MD, PhD<sup>1</sup>; and Bjorn Sonesson, MD, PhD<sup>1</sup> J ENDOVASC THER 2005;12:556-559

**Purpose:** To describe a technique of aortic clamping during endovascular aneurysm repair (EVAR) in patients with ruptured abdominal aortic aneurysms (AAA) and circulatory collapse.

**Technique:** A balloon catheter is inserted percutaneously from the femoral artery and inflated in the suprarenal aorta. An introducer sheath must support the balloon. The stent-graft is passed from the contralateral groin and deployed beneath the balloon. The sheath makes it possible to retrieve the balloon after the endograft has been deployed. Carbon dioxide facilitates angiography while the aortic blood flow is arrested.

**Conclusions:** The aortic stent-graft can be deployed while the aorta is continuously "clamped" from a transfemoral approach. This may allow EVAR in patients with circulatory collapse due to aneurysm rupture.



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ EVAR

## Endovascular aneurysm repair for ruptured abdominal aortic aneurysm: The Albany Vascular Group approach

Manish Mehta, MD, MPH, *Albany, NY*

Improvements in endovascular technology and techniques have allowed us to treat patients in ways we never thought possible. Today, endovascular treatment of ruptured abdominal aortic aneurysms is associated with markedly decreased morbidity and mortality compared with the open surgical approach, yet there are several fundamental obstacles in our ability to offer these endovascular techniques to most patients with ruptured aneurysms. This article will focus on the technical aspects of endovascular aneurysm repair for rupture, with particular attention to developing a standardized multidisciplinary approach that will help vascular surgeons deal with not just the technical aspects of these procedures but also address some of the challenges, including the availability of preoperative computed tomography, the choice of anesthesia, the percutaneous vs femoral cutdown approach, use of aortic occlusion balloons, need for bifurcated vs aortouniiliac stent grafts, need for adjunctive procedures, diagnosis and treatment of abdominal compartment syndrome, and conversion to open surgical repair. (J Vasc Surg 2010;52:1706-12.)



# Urgenze aorto-iliache

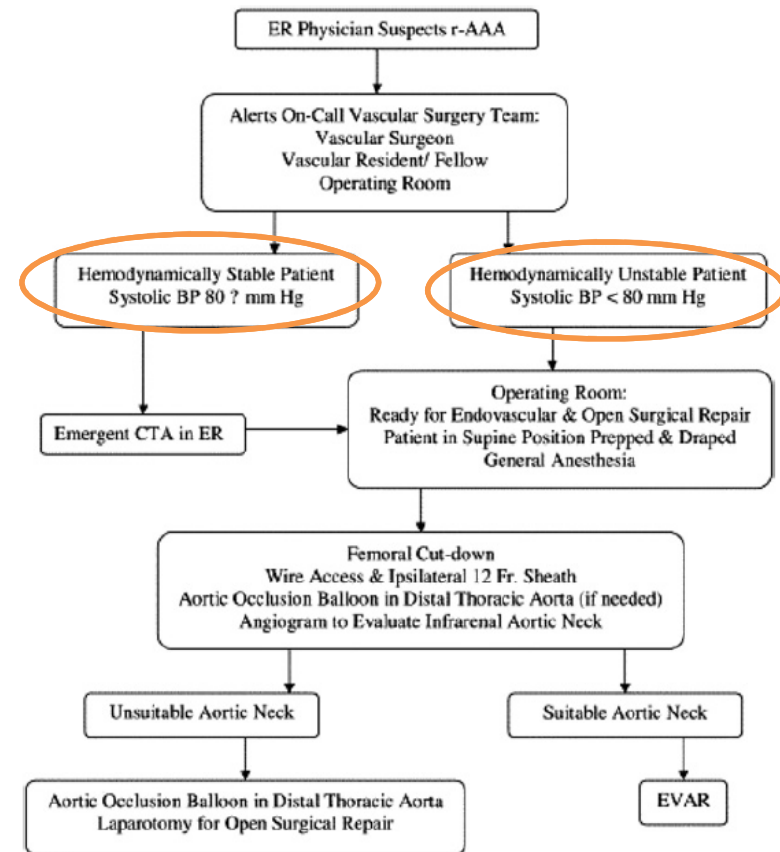
## Rottura dilatazione aneurismatica

### ❖ EVAR

Endovascular aneurysm repair for ruptured abdominal aortic aneurysm: The Albany Vascular Group approach

Manish Mehta, MD, MPH, Albany, NY

### ★ Multidisciplinary approach



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ EVAR

Endovascular aneurysm repair for ruptured abdominal aortic aneurysm: The Albany Vascular Group approach

Manish Mehta, MD, MPH, *Albany, NY*

Factors associated with abdominal compartment syndrome complicating endovascular repair of ruptured abdominal aortic aneurysms

Manish Mehta, MD, MPH, R. Clement Darling III, MD Sean P. Roddy, MD, Scott Fecteau, MD, Kathleen J. Ozsvath, MD, Paul B. Kreienberg, MD, Philip S. K. Paty, MD, Benjamin B. Chang, MD, and Dhiraj M. Shah, MD, *Albany, NY* J VASC SURG 2005 ;42:1047-51

### ☆ Assessing for Abdominal compartment syndrome (ACS)

Increased recognition of new complications, such as ACS.<sup>9</sup> The pathophysiology of ACS after EVAR for ruptured AAA is multifactorial: (1) the retroperitoneal hematoma is a space-occupying lesion and a significant factor contributing to intra-abdominal hypertension, (2) ongoing bleeding from lumbar and inferior mesenteric arteries into the disrupted aneurysm sac in the setting of severe coagulopathy might be a contributing factor, and (3) the shock state associated with ruptured AAA is associated with alterations in microvascular permeability that can lead to visceral and soft tissue edema.

❖ The incidence of ACS was 18%

❖ Patients with ACS had a significantly increased mortality (67%) compared with those without ACS (10%)

# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ EVAR vs Chirurgia “OPEN”

#### Trans-Atlantic Debate: Whether Endovascular Repair Offers a Survival Advantage over Open Repair for Ruptured Abdominal Aortic Aneurysms

T.L. Forbes, Associate Editor, Journal of Vascular Surgery      Eur J Vasc Endovasc Surg (2015) 49, 116e128

During the last decade new information and reports have been published regularly describing endovascular and open repair of ruptured abdominal aortic aneurysms; despite this, however, disagreement persists over which therapy is best. At the root of the problem is the discrepancy between

the findings of multiple, well-performed observational studies and a smaller number of randomized controlled trials. Our debaters do an excellent job of summarizing the current status of the world literature and describing their conflicting interpretations.

#### Part One: For the Motion. EVAR Offers No Survival Benefit over Open Repair for the Treatment of Ruptured Abdominal Aortic Aneurysms

L. Dubois

#### Part Two: Against the Motion. EVAR Offers No Survival Benefit over Open Repair for the Treatment of Ruptured Abdominal Aortic Aneurysms

1<sup>st</sup> | D. Mayer<sup>\*</sup>, Z. Rancic, F.J. Veith, M. Lachat

*Emergencies in Interventional Radiology*



# Urgenze aorto-iliache

## Rottura dilatazione aneurismatica

### ❖ EVAR vs Chirurgia “OPEN”

## Endovascular vs. Open Repair for Ruptured Abdominal Aortic Aneurysm

Med Sci Monit Basic Res, 2016; 22: 34-44

Nikolaos Patelis  
Demetrios Moris  
Georgios Karaolanis  
Sotiris Georgopoulos

1 Vascular Unit, First Department of Surgery, Laiko General Hospital, Medical School, National & Kapodistrian University of Athens, Athens, Greece  
2 Lerner Research Institute, Cleveland Clinic Foundation, Cleveland, OH, U.S.A.

**Background:** Patients presenting with ruptured abdominal aortic aneurysms are most often treated with open repair despite the fact that endovascular aneurysm repair is a less invasive and widely accepted method with clear benefits for elective aortic aneurysm patients. A debate exists regarding the definitive benefit in endovascular repair for patients with a ruptured abdominal aortic aneurysm. The aim of this literature review was to determine if any trends exist in favor of either open or endovascular repair.

**Material/Methods:** A literature search was performed using PUBMED, OVID, and Google Scholar databases. The search yielded 64 publications.

**Results:** Out of 64 publications, 25 were retrospective studies, 12 were population-based, 21 were prospective, 5 were the results of RCTs, and 1 was a case-series. Sixty-one studies reported on early mortality and provided data comparing endovascular repair (rEVAR) and open repair (rOR) for ruptured abdominal aneurysm groups. Twenty-nine of these studies reported that rEVAR has a lower early mortality rate. Late mortality after rEVAR compared to that of rOR was reported in 21 studies for a period of 3 to 60 months. Results of 61.9% of the studies found no difference in late mortality rates between these 2 groups. Thirty-nine publications reported on the incidence of complications. Approximately half of these publications support that the rEVAR group has a lower complication rate and the other half found no difference between the groups. Length of hospital stay has been reported to be shorter for rEVAR in most studies. Blood loss and need for transfusion of either red cells or fresh frozen plasma was consistently lower in the rEVAR group.

**Conclusions:** Differences between the included publications affect the outcomes. Randomized control trials have not been able to provide clear conclusions. rEVAR can now be considered a safe method of treating rAAA, and is at least equal to the well-established rOR method.

★ Mortality (early/late)

★ Complications rates



# Urgenze aorto-iliache

## The dark side of the guidelines

First Author	Year	Type of study	Number of patients	% treated with rEVAR	Early mortality (endo % vs. open %; p value)
Ohki [36]	2000	Retrospective	25	80.0%	No difference (10% vs. 0%; NS)
Hinchcliffe [37]	2001	RCT (Nottingham trial)	32	49.0%	No difference (53% vs. 53%)
Yilmaz [38]	2002	Prospective/Retrospective	64	37.5%	No difference (24% vs. 41%; NS)
Peppelenbosch [10]	2003	Prospective/Retrospective	40	65.0%	No difference (31% vs. 50%; NS)
Resch [39]	2003	Prospective/Retrospective	37	37.8%	No difference (29% vs. 35%; p>.05)
Reichart [40]	2003	Prospective/Retrospective	26	23.1%	N/A
Lee [41]	2004	Retrospective	36	36.0%	Lower in rEVAR (7.7% vs. 30.8%)
Alsac [26]	2005	Case series	37	46.0%	Lower in rEVAR (23.5% vs. 50%; p=.09)
Kapma [42]	2005	Prospective	253	15.8%	Lower in EVAR (13% vs. open 30%; p=.021)
Larzon [28]	2005	Prospective	50	30.0%	No difference (13% vs. 46%; p>.05)
Castelli [27]	2005	Retrospective	46	54.3%	No difference (20% vs. 47.6%; NS)
Vaddenini [43]	2005	Retrospective	24	62.5%	No difference (22% vs. 26%)
Brandt [44]	2005	Retrospective	39	54.0%	Lower in rEVAR (8% vs. 53%; P=.003)
Peppelenbosch [45]	2006	Prospective; Multicentre (ERA trial)	100	49.0%	No difference (35% vs. 39%; p=.78)
Greco [35]	2006	Population-based	5798	3.4%	N/A
Visser [46]	2006	Prospective	55	47.3%	No difference (31% vs. 31%; p=.98)
Arya [47]	2006	Prospective ITT	51	33.3%	No difference (24% vs. 47%; p=.14)
Franks [48]	2006	Retrospective	19	47.3%	No difference (11% vs. 54%; p=.03)
Coppi [49]	2006	Retrospective	124	26.6%	No difference (30% vs. 46%)
van der Viet [50]	2007	Prospective	77	64.0%	Lower in EVAR (25% vs. 49%; p=.04)
Moore [51]	2007	Prospective; Protocol modified	126	15.9%	Lower in rEVAR (5% vs. 28%; p=.0084)
Najjar [52]	2007	Retrospective	37	40.5%	No difference (6.7% vs. 13.6%; p=.61)
Ockert [53]	2007	Retrospective	58	50.0%	No difference (31% vs. 31%; p=1.0)
Sharif [54]	2007	Retrospective	126	58.7%	Lower in EVAR (32.7% vs. 51.4%; p=.05)
Acosta [55]	2007	Retrospective	162	34.6%	No difference (34% vs. 45% in-hospital mortality; p=.16)
Anain [56]	2007	Retrospective	40	75.0%	No difference (17% vs. 40%; p=.19)
Dalainas [57]	2008	Prospective	28	71.4%	No difference (40% vs. 62.6%; p>.05)
Egorova [34]	2008	Population-based	43033	2.5%	Lower in rEVAR up to 90 days postop
Lesperance [58]	2008	Population-based	9931	9.6%	Lower in rEVAR (31% vs. 42%; p<.001)
Lee [59]	2008	Prospective	37	45.9%	Lower in EVAR (35% vs. 75%; p=.02)
Wibmer [30]	2008	Retrospective	47	34.0%	No difference (0% vs. 12.9%; p=.28)
Giles [60]	2009	Population-based	567	21.0%	Lower in rEVAR (24% vs. 36%; p<.05)
Giles [61]	2009	Population-based	28429	8.2%	Lower in rEVAR (33% vs. 41%; p<.001)

First Author	Year	Type of study	Number of patients	% treated with rEVAR	Early mortality (endo % vs. open %; p value)
McPhee [62]	2009	Population-based	27750	11.5%	Lower in rEVAR (31.7% vs. 40.7%; p <.0001)
Vogel [63]	2009	Population-based	5176	12.0%	No difference (45.1% vs. 52.4%; p=.21)
Verhoeven [64]	2009	Prospective	159	71.7%	Lower in EVAR (20% vs. 27.2%)
Visser [65]	2009	Prospective; Multicentre	201	28.9%	No difference (26% vs. 40%; p=.06)
Vun [66]	2009	Retrospective	45	15.6%	Lower in EVAR (0% vs. 42%)
Veith [67]	2009	Retrospective	1443	47.1%	Lower in EVAR (17.4±8.9% vs. 35.8±12.4%; p=.0001)
Holt [68]	2010	Population-based	4414	7.6%	Lower in EVAR (32.2% vs. 47.4%; p<.001)
Lyons [69]	2010	Retrospective	47	38.0%	No difference (11% vs. 32%; NS)
Starnes [70]	2010	Retrospective	46	48.0%	Lower in EVAR (18.5% vs. 54.2%; p=.01)
Chaggar [71]	2010	Retrospective	167	19.2%	Lower in rEVAR (15.6% vs. 43.7%; p=.004)
Van Schaik [72]	2011	Prospective	56	26.8%	Lower in EVAR (26% vs. 46%)
Sarac [73]	2011	Retrospective	160	32.0%	No difference (31.2% vs. 32%; p=.93)
Ten Bosch [74]	2012	Prospective	129	19.0%	Lower in EVAR (20% vs. 45%; p=.021)
Mayer [75]	2012	Prospective ITT; Multicentre	473	57.0%	Lower in rEVAR (15.7% vs. 37.4%; p=0.35)
Ioannidis [76]	2012	Retrospective	43	46.5%	No difference (35% vs. 43%; p=.627)
Neddeau [77]	2012	Retrospective	74	25.7%	Lower in rEVAR (15.7% vs. 49%; p=.008)
Noorani [78]	2012	Retrospective	102	51.0%	Lower in rEVAR (12% vs. 28%)
Saqib [25]	2012	Retrospective	278	13.3%	No difference (50% vs. 54%; p=.66)
Park [79]	2013	Population-based	16558	22.9%	Lower in rEVAR (OR=0.492; CI, 0.380-0.636)
Mehta [80]	2013	Prospective ITT	283	42.4%	Lower in rEVAR (24.2% vs. 44.2%; p<.005)
Reimerink [81]	2013	RCT (AJAX trial)	116	49.1%	No difference (21% vs. 25%; p=.66)
Wu [82]	2014	Retrospective	36	42.9%	No difference (33.3% vs. 15.5%; p=.201)
Mohan [83]	2014	Population-based	41,126	19.3%	Lower in EVAR (25.9% vs. 39.1%; p<.0001)
Sneicher [84]	2014	Population-based	1997	30.7%	Lower in EVAR (26.2% vs. 38.5%; p<.001)

Sixty-one studies report on early mortality and provide comparative data between the rEVAR and rOR groups (Table 1). Twenty-nine of these studies support that rEVAR presented with a lower early mortality rate, but only 22 report the statistical significance of the respective results. The rest of the studies, including 4 RCTs, conclude that there is no difference in early mortality between the 2 groups. Almost all the popu-



First Author	Late mortality	Follow-up period (months)	p value
Huang [19]	Higher in rEVAR	60	<.001; No difference for patients operated after 2005 (p=.57)
Ten Bosch [74]	Lower in EVAR	N/A	<0.14
Edwards [85]	Lower in rEVAR	>48	N/A
Noorani [78]	Lower in rEVAR	24	N/A
Mehta [87]	Lower in rEVAR	N/A	<.005
Greco [35]	Lower in rEVAR	48	.005
Neddeau [77]	Lower in rEVAR	20	N/A
Egorova [34]	Lower in rEVAR	N/A	.004
Visser [29]	No difference	N/A	.19
Reichert [40]	No difference	6	NS
Ockert [53]	No difference	Mean 40.25	.41
Lyons [69]	No difference	6	NS
Wibmer [30]	No difference		
Reimerink [81]	No difference		
van Beek [24]	No difference		
Gunnarsson [22]	No difference		
Peppelenbosch [45]	No difference		
Improve Trial Investigators [23]	No difference		
Saqib [25]	No difference		
Wu [82]	No difference		
Desgranges [86]	No difference		
Sarac [73]	No difference		

Late mortality after rEVAR compared to that of rOR was reported in 21 manuscripts (Table 2). Authors report their respective results for periods ranging from 3 to 60 months. Results from 13 studies (61.9%) show no difference in late mortality rates between the rEVAR and the rOR groups, with 3 RCTs being among these studies. Seven studies (33.3%) report lower late mortality rates for the rEVAR group, including 2 population-based studies and 1 prospective intention-to-treat (ITT) study. Only 1 study (4.8%) reported a higher late mortality rate in the rEVAR group, but if early data is excluded (prior to 2005), the respective late mortality rates do not differ between the rEVAR and the rOR groups (p=.57).

First Authors	Complications	p value
Peppelenbosch [10]	Higher in rEVAR groups	N/A
Peppelenbosch [45]	Lower in rEVAR group	≤.02 (No difference @ 3 months)
Brahmbhatt [88]	Lower in rEVAR group	<.001
Resch [39]	Lower in rEVAR group	N/A
Alsac [26]	Lower in rEVAR group	N/A
Castelli [27]	Lower in rEVAR group	N/A
Brandt [44]	Lower in rEVAR group	N/A
Dalainas [57]	Lower in rEVAR group	N/A
Lesperance [58]	Lower in rEVAR group	N/A
Giles [60]	Lower in rEVAR group	N/A
McPhee [62]	Lower in rEVAR group	N/A
Van Schaik [72]	Lower in rEVAR group	N/A
Nedea [77]	Lower in rEVAR group	N/A
Gunnarsson [22]	Lower in rEVAR group	N/A
Desgranges [86]	Lower in rEVAR group	N/A
Improve Trial Investigators [23]	Lower in rEVAR group	N/A
Huang [19]	Lower in rEVAR group	N/A
Noorani [78]	Lower in rEVAR group	<.001
Giles [89]	Lower in rEVAR group	<.01
Speicher [84]	Lower in rEVAR group	<.001
Park [79]	Lower in rEVAR group	OR=0.535; CI, 0.395-0.724
Ohki [36]	Lower in rEVAR group	N/A
van Beek [24]	No difference	N/A
Greco [35]	Lower in rEVAR group (regarding systemic complications; no difference in postoperative method-related complications)	N/A
Arya [47]	No difference	N/A
Hinchcliffe [37]	No difference	N/A
Anain [56]	No difference	N/A
Saqib [25]	No difference	N/A
Wu [82]	No difference	Thirty-nine publications report on the complication incidence, most in a narrative way, with only 12 publications reporting their complication rates with statistical significance (Table 3). Twenty of these publications support that the rEVAR group has a lower complication rate and 18 report no difference between the rEVAR and the rOR groups. One study concluded that the rEVAR group had a higher incidence of complications, but no p value was reported [10]. Data regarding complications are extremely heterogeneous in methods of recording, grouping, and reporting the complications.
Larzon [28]	No difference	
Franks [48]	No difference	
Ockert [53]	No difference	
Coppi [49]	No difference	
Reimerink [81]	No difference	
Vaddenini [43]	No difference	
Lee [41]	No difference	
Visser [29]	No difference	
Wibmer [30]	No difference	
Lyons [69]	No difference	

In this review, only 3 papers concluded that rEVAR had significantly higher incidence of ACS than rOR [22–24]. One paper reports no difference between the rOR and rEVAR groups regarding ACS [25]. Five more papers describe single cases of ACS without any comparative data [26–30]

The differences between the publications lie in the design of the respective study, the study duration, the type of endografts used, volume of patients each study center enrolled, and many other characteristics, each affecting the overall outcome. RCTs have not been able to provide clear conclusions apart from that rEVAR is not inferior to rOR regarding mortality and complications.

rEVAR can now be considered a safe method of treating rAAA, being at least equal to the well-established rOR. Further studies are necessary to clarify the advantages and disadvantages of each repair method and the sub-groups of patients who will benefit the most from each method.



# Urgenze aorto-iliache

## Complicanze post-procedurali

### ❖ Chirurgia "OPEN"

<b>Precoci*</b>	Emorragia anastom. Embolia distale Trombosi protesica Colite ischemica Infezione protesica	<b>Tardive*</b>	<b>Correlate alla protesi</b> Pseudoaneurismi anastomotici Trombosi protesica Infezione della protesi Raccolte liquide periprotetiche Fistola aorto-enterica
* Entro 30 giorni dall'intervento			
<b>Opzione Endovascolare</b>			
Trombosi protesica Pseudoaneurismi anastomotici Fistola aorto-enterica			<b>Non correlate alla protesi</b> Laparocele Aderenze intestinali Disfunzioni sessuali Claudicatio glutea

# Urgenze aorto-iliache

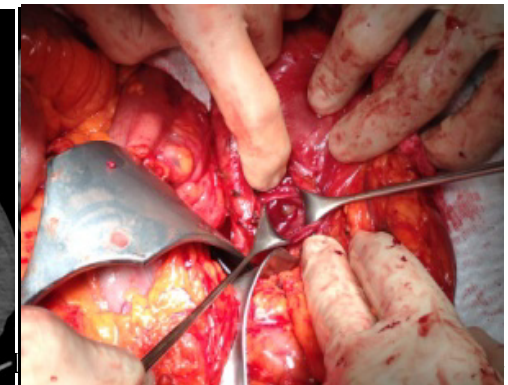
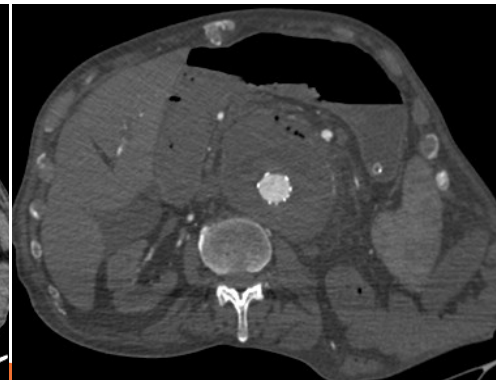
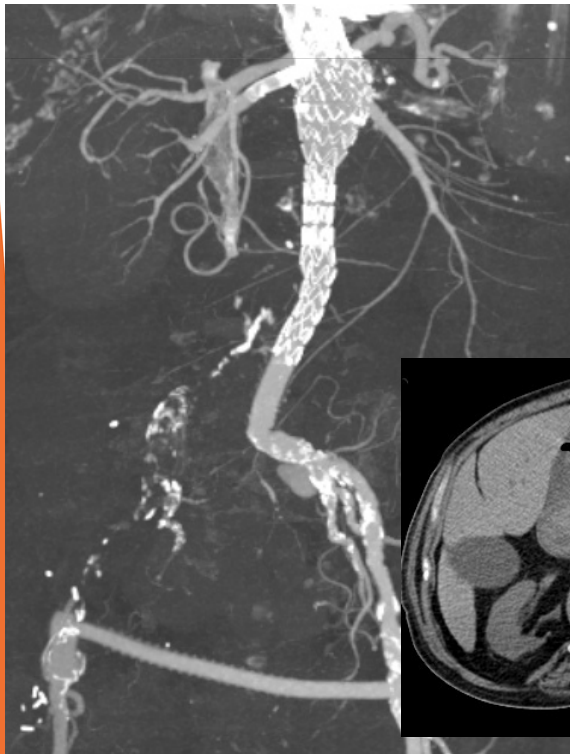
## Complicanze post-procedurali

### ❖ Chirurgia "OPEN" – Fistola aorto-enterica

★ L'incidenza è dell'1% in caso di pazienti sottoposti ad intervento chirurgico in elezione e del 14% in caso di trattamento di aneurisma rotto. Le cause sono meccaniche (decubito dell'anastomosi sulle pareti del tratto intestinale) ed infettive

★ Opzione terapeutica: Intervento chirurgico  
(tasso di mortalità pari al 50%)

★ In casi selezionati può essere effettuato un trattamento endovascolare come "ponte" per il successivo trattamento definitivo

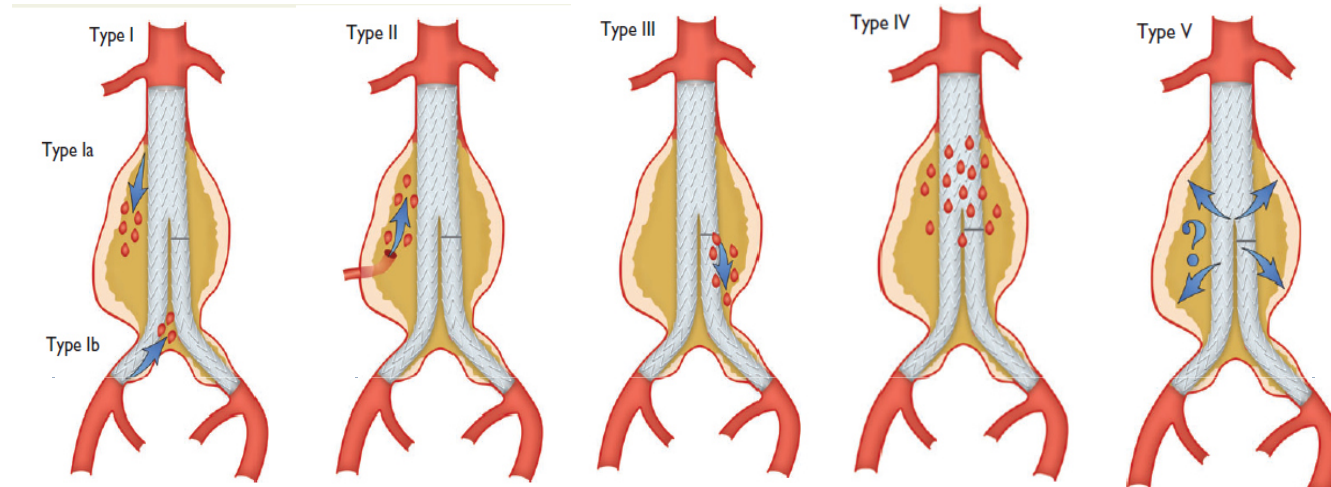


# Urgenze aorto-iliache

## Complicanze post-procedurali

### ❖ EVAR

#### ☆ Leak



- ☆ Complicanze a livello delle sedi di accesso (> accesso percutaneo, 3%)
- ☆ Rottura della sacca aneurismatica esclusa (0.5%)
- ☆ Infezione della protesi (<1%)
- ☆ Compromissione della funzionalità renale post-EVAR (6.7%)
- ☆ Trombosi (incidenza del 0.5-11%)



# Urgenze aorto-iliache

## Complicanze post-procedurali

### ❖ EVAR

#### ★ Trombosi acuta

Clinical presentation of occlusion was acute in only 50% of patients, with the remaining presenting with claudication.

More than half of all occlusions in this study occurred ≤2 months after EVAR, and 90% occurred within the first year. This observation is in agreement with previous publications<sup>2,5</sup> and alerts to the importance of careful observation and patient information, especially during the first year after EVAR.

Variable	No. (%)
Open surgery	15 (75)
Embolectomy	4 (20)
Graft extension	1 (5)
Femorofemoral crossover bypass	5 (25)
Axillofemoral bypass	2 (10)
Embolectomy with stent	3 (15)
Initial thrombolysis attempt	4
Percutaneous intervention	5 (25)
Thrombolysis/PTA with stent	4 (13.6)
Thrombolysis/PTA without stent	1 (4.5)

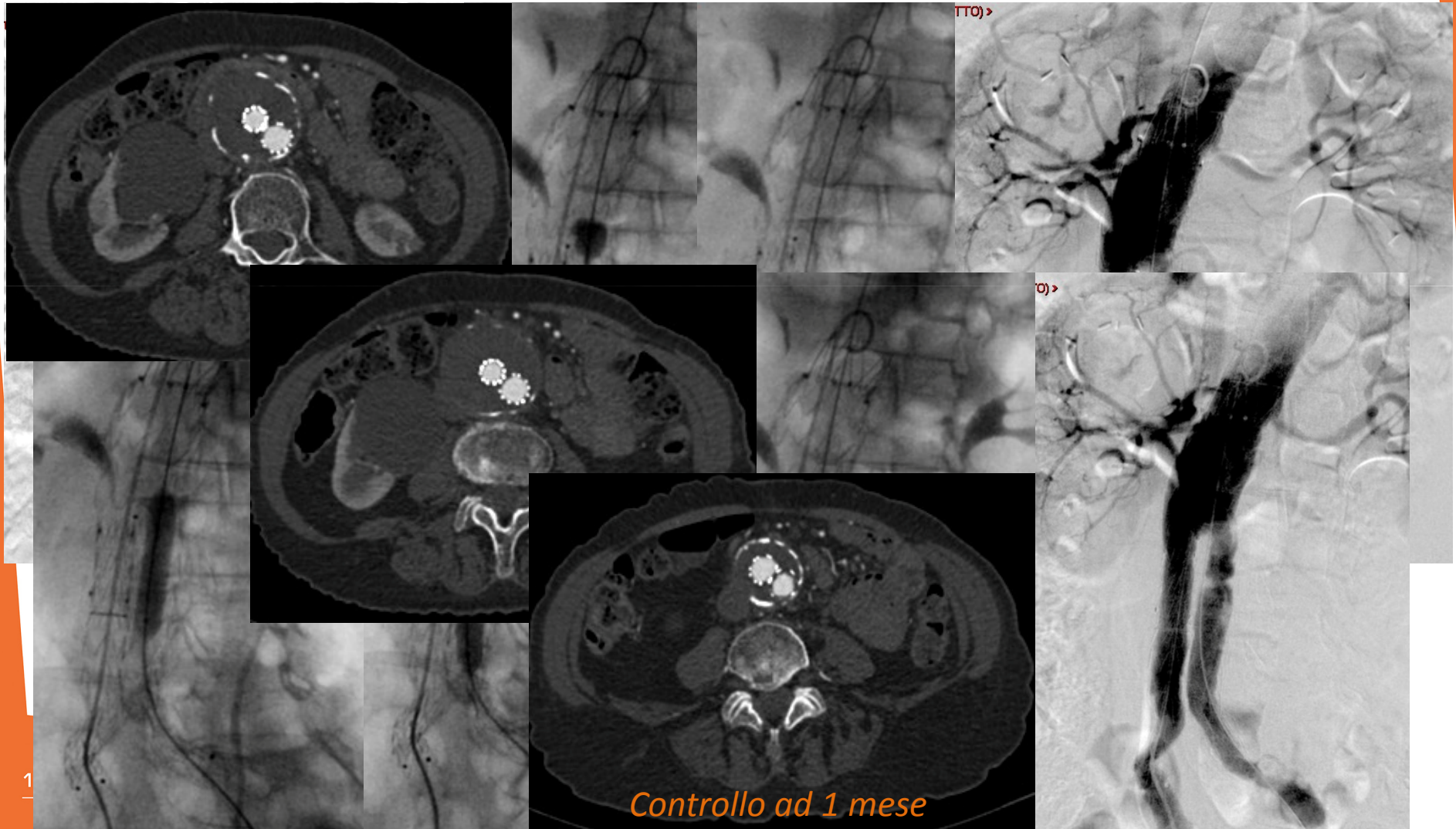
#### Incidence and treatment results of Endurant endograft occlusion

Laura van Zeggeren, MD,<sup>a</sup> Frederico Bastos Gonçalves, MD,<sup>b</sup> Joost A. van Herwaarden, MD, PhD,<sup>c</sup> Herman J. A. Zandvoort, MD,<sup>c</sup> Debora A. B. Werson, MPA,<sup>a</sup> Jan-Albert Vos, MD, PhD,<sup>d</sup> Frans L. Moll, MD, PhD,<sup>c</sup> Hence J. Verhagen, MD, PhD,<sup>b</sup> and Jean-Paul P. M. de Vries, MD, PhD,<sup>a</sup> Nieuwegein, Rotterdam, and Utrecht, The Netherlands (J Vasc Surg 2013;57:1246-54.)

In 12 patients (60%), a technical error was considered to be the cause of the occlusion, including extreme oversizing, positioning of the graft in a kink of the iliac vessel limiting outflow considerably (Fig 3), performance of the completion angiogram without removing the stiff guidewire, or an overlooked indication for percutaneous transluminal angioplasty/stenting, both within the endograft limb or resulting from the presence of a hemodynamically significant stenosis of flow-limiting dissection in the external iliac artery during the initial procedure. No technical cause for the obstruction was found in the other eight (40%). An outflow problem was identified in two of these patients, and two presented with very challenging anatomy, with severe tortuosity of the iliac arteries or a narrow aortic bifurcation, which might have been the cause for the occlusion. For the other six patients, the occlusion remained unexplained.

# Urgenze aorto-iliache

## Complicanze post-procedurali





# Urgenze aorto-iliache

## Patologia traumatica

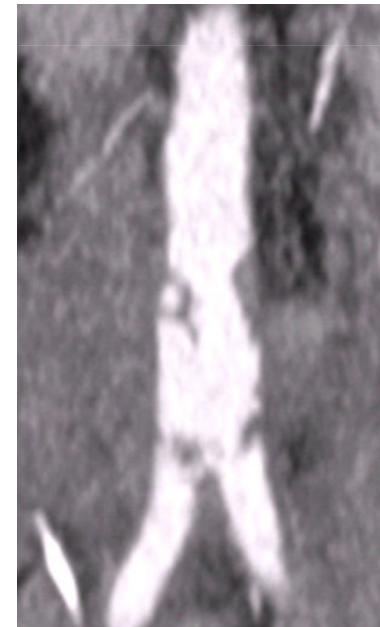
### Blunt abdominal aortic injury

Sherene Shalhub, MD, MPH,<sup>a</sup> Benjamin W. Starnes, MD,<sup>a</sup> Nam T. Tran, MD,<sup>a</sup>  
 Thomas S. Hatsukami, MD,<sup>a</sup> Rachel S. Lundgren, MD,<sup>a</sup> Christopher W. Davis, MD,<sup>a</sup>  
 Samantha Quade, MD,<sup>a</sup> and Martin Gunn, MBChB,<sup>b</sup> *Seattle, Wash* JOURNAL OF VASCULAR SURGERY  
May 2012

Blunt abdominal aortic injury (BAAI) is rare and accounts for only 5% of blunt aortic injuries. This is partly due to the protected position of the abdominal aorta and a high associated mortality. Patients who sustain BAAI rarely reach the hospital alive,<sup>1</sup> and those who do, have a reported 24% in-hospital mortality.<sup>2</sup> BAAI is

#### Mechanism of injury

Motor vehicle crash	16 (57)
Motor cycle crash	3 (11)
Car vs pedestrian	3 (11)
Car vs bicycle	1 (3.6)
Fall	2 (7)
Crush injury	2 (7)
All terrain vehicle crash	1 (3.6)





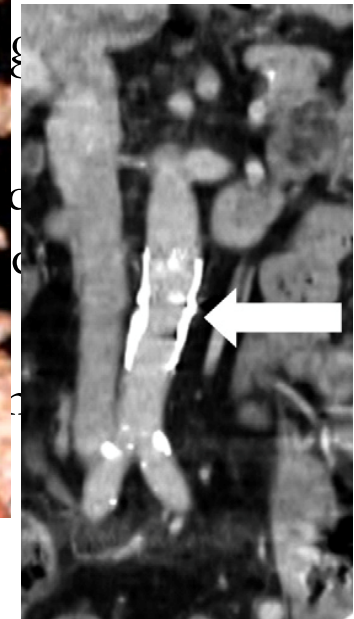
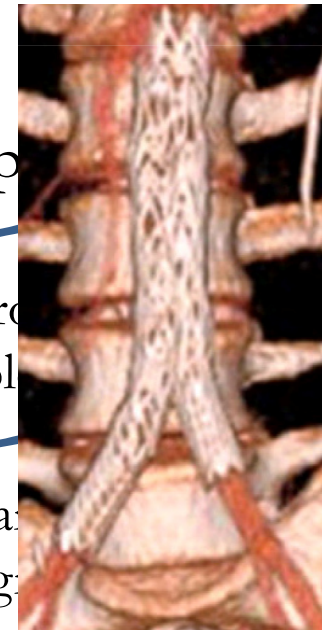
# Urgenze aorto-iliache

## Patologia traumatica

### Blunt abdominal aortic injury

Sherene Shalhub, MD, MPH,<sup>a</sup> Benjamin W. Starnes, MD,<sup>a</sup> Nam T. Tran, MD,<sup>a</sup>  
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May 2012

- ★ Intimal tear/minimal aortic injury      Nonoperative
- ★ Large intimal flap (LIF)      Evidence for preoperative repair when possible
- ★ Pseudoaneurysm      End-to-end anastomosis



# Urgenze aorto-iliache

## Patologia traumatica

J Cardiovasc Surg (Torino). 2012 Aug;53(4):495-506. Epub 2012 Jan 24.

### **Endovascular management of peripheral arterial trauma in patients presenting in hemorrhagic shock.**

Trellopoulos G<sup>1</sup>, Georgiadis GS, Aslanidou EA, Nikolopoulos ES, Pitta X, Papachristodoulou A, Lazarides MK.

**CONCLUSION:** Endo-R of traumatic non-aortic arterial injuries or spontaneous ruptures might be considered as a treatment option-in preference to open repair-even in emergency settings such as in shock patients. However, the safety of endovascular treatment in unstable trauma patients must be proved after comparison with open surgical treatment.

J Cardiovasc Surg (Torino). 2014 Aug;55(4):559-61.

### **Iatrogenic iliac rupture and acute limb ischemia during recanalization of bilateral iliac axis occlusion (TASC D).**

Setacci F<sup>1</sup>, Galzerano G, Sirignano P, De Donato G, Setacci C.

## Covered stents for endovascular repair of iatrogenic injuries of iliac and femoral arteries☆

Cardiovasc Revasc Med. 2015 Apr-May;16(3):156-62

Sebastian Kufner✉, Salvatore Cassese, Philipp Groha, Robert A. Byrne, Heribert Schunkert, Adnan Kastrati, Ilka

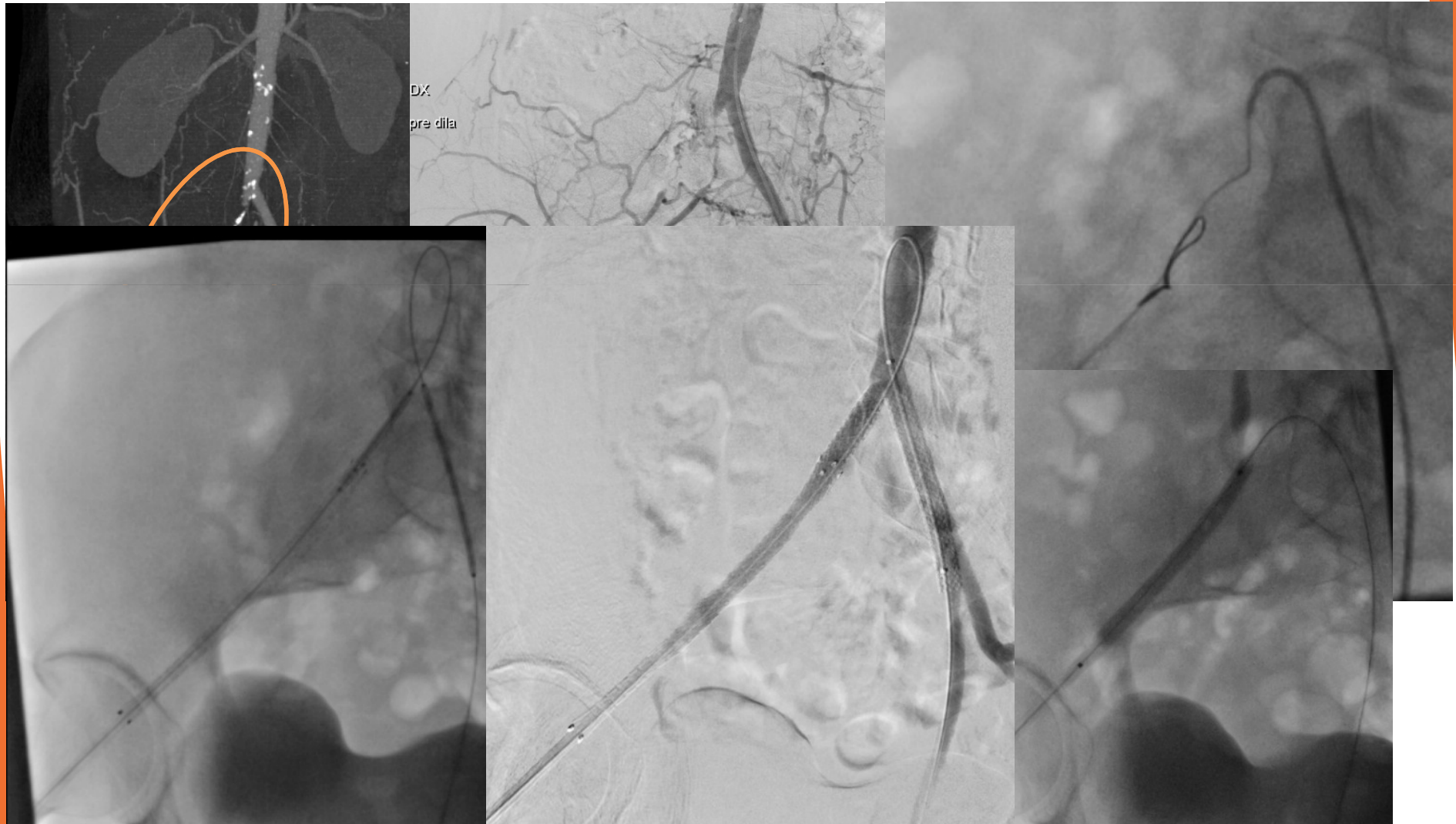
## Iliac injury during abdominal and thoracic aortic endovascular intervention JVS 2016;64(3):726-730

1<sup>st</sup> Interventional P Samir K. Shah, MD✉, Federico E. Parodi, MD, Matthew J. Eagleton, MD, James F. Bena, MS, Daniel G. Clair, MD  
Emergencies in



# Urgenze aorto-iliache

## Patologia traumatica iatrogena





# Conclusioni

Rottura dilatazione  
aneurismatica

rEVAR can now be considered a safe method of treating rAAA, being at least equal to the well-established rOR. Further studies are necessary to clarify the advantages and disadvantages of each repair method and the sub-groups of patients who will benefit the most from each method.

**Med Sci Monit Basic Res, 2016; 22: 34-44**

Patologia traumatica

*Conclusions:* The index of suspicion for BAAI should be raised in severely injured patients by the presence of injuries to the lumbar spine, bowel, retroperitoneal organs, and adjacent major arteries. Although endovascular repair is the most common intervention, most patients are managed nonoperatively and survive to hospital discharge. (J Vasc Surg 2012; 56:656-60.)

