Chimney EVAR (ChEVAR) vs. Fenestrated EVAR (FEVAR) for Juxtarenal Aneurysm

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Juxtarenal Aneurysm

About 15% of abdominal aortic aneurysm
Not only renal arteries to be considered in endovascular repair

To exclude the aneurysm from flow by extending the sealing zone
and preserve FLOW TO branch visceral vessel

Complex endovascular procedure needed

Variety of methods developed for branch vessel incorporation
Broadly into two types

Fusing of devices (i.e., branched or fenestrated repairs)
Layering of devices (i.e., chimney or sandwich repairs [chimneys, periscopes, snorkels {CHIMPS}]).

FEVAR vs CHEVAR

Blood to the visceral branch arteries via different routes

FEVAR via lumen of endograft and perpendicular into branch stents
Generally shorter, straighter, more representative of native anatomy

Ch-EVAR
Branch stent is outside graft and parallel to endograft : gutter
Generally longer, tortuous pathway, often with an acute bend at the ostium
Patency Long-term may be an issue

FEVAR

First introduced in 1999 Lawrence Brown et al Perth
Currently Cook and Terumo
Planning and manufacture CUSTOM Made
Delay between decision for and actual endovascular treatment (4-8w)
Cost
Availability Potentially Solved by off the shelf
Profile 22F (not suited for small tortuous iliacs)
Technically challenging procedure Procedure time/radiation exposure
Problems with complex renal anatomy eg inferior, downward takeoff
No visceral stenosis >50%
Small(<4mm) Visceral Vessels

Equipment more standardized for FEVAR compared to CHEVAR with regulatory approvals

ChEVAR

2003 by Greenberg et al Bail out to salvage vessel
Filled the void of lack of availability of fenestrated graft

Emergency use
Greater Anatomic availability
Off the shelf equipment
Less complex planning
Avoid delay in manufacture
Cost may be reduced
Case Unsuitable for FEVAR due to anatomy eg iliac disease
Low profile 14-18F endograft
Flexibilty
Deliverability
Possible shorter procedure time
All branches can be stented

Equipment much more variable Endograft and stent

Problems?

Overall technical success

Gutter-related Type Ia endoleaks requiring reintervention

Chimney stent-graft patency

Long-term renal dysfunction

Long-term durability

Chimney EVAR (ChEVAR) vs Fenestrated EVAR (FEVAR)

No randomized trial
Studies Initially small
Systematic reviews
Meta analyses individual series and direct comparison of two options
PERICLES ChEVAR registry
Prothagoras ChEVAR standardize 20-30% oversize
Globalstar FEVAR registry

Direct Comparison is challenging
Groups are not comparable
Variable definition and reporting of outcomes
Publication bias
Conflicts of interest
Varying lengths of follow-up

FEVAR early mid and long term result available
CHEVAR early and mid available

Outcomes

Mortality Early and Late
Overall technical success
Endoleaks especially Type 1 gutter related
Re-interventions
Stent patency early and late
Renal dysfunction
Cerebrovascular CHEVAR 3.2 vs 0.3% FEVAR
Long-term durability
Others Cardiac, Cost, Radiation, blood loss, LOS

Initially
FEVAR better 30-day mortality, late mortality, Rates of Type 1 endoleak, renal loss early and late, Endoleak and Reintervention
CHIMNEY shorter operative and fluoroscopy procedures, lower contrast doses, less blood loss
Tainted by greater acute cases in Chimney Group

NOW
With increasing expertise in both techniques in the more recent papers differences in **outcome results less apparent** (patient outcomes, stent-graft patency, and re-intervention rates and renal problems)

FEVAR

Elective only. Off the Shelf P branch from Cook may change this

Renal orientiation Horizontal, Cranially directed renal arteries
Proximal renal artery branching and/or baseline renal impairment

Upper extremity occlusive disease.
Difficult aortic arch eg type 3
Atheromatous (“shaggy”) thoracic aorta.

ChEVAR

Urgent cases. symptomatic, rapidly expanding, or ruptured (AAAs)

Lack of expertise and availability
Technical requirements less demanding compared to the fenestrated approach

Hostile iliofemoral access. Small, calcified, and/or tortuous iliofemoral systems affect passage and rotation of FEVAR

Caudal-directed renal arteries
Target vessel stenosis
Close proximity of superior mesenteric artery and most cranial renal artery : manufacture of FEN graft
Prior endovascular aortic reconstruction
Tortuous visceral aortic segment difficult orientation and deployment: shuttering with FEVAR

Conclusion

Do Not Forget Open Repair

Both CHEVAR and FEVAR Valid solutions in treating juxtarenal aneuryms
Complementary strategies for the hostile aorta and can be combined

FEVAR would be my FIRST choice : Clinical Indication and Time available and anatomy suitable

Access and experience in BOTH are needed in the armamentarium of physicians treating complex aortic aneurysms

Factors in choosing: Clinical presentation,Expertise, Graft Availability, Access, Aneurysm and Visceral branch Anatomy, No of branch stents needed, Thromboembolic risk

To get a more definitive answer of CHIMNEY vs FEVAR
Need responsible reporting using reporting standards Both good and bad results
Need ongoing evaluation of the results of FEVAR and Ch-EVAR as well as long term durability data
Randomized Trial : Literature suggest it will never happen.