

# Total percutaneous endovascular aneurysm repair (pEVAR): the initial experience in Hospital Kuala Lumpur

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## ABSTRACT

**Introduction:** There has been a paradigm shift in the treatment of AAA with the advent of endovascular aneurysm repair (EVAR). Rapid progress and evolution of endovascular technology has brought forth smaller profile devices and closure devices. Total percutaneous endovascular aneurysm repair (pEVAR) involves the usage of suture-mediated closure devices (SMCDs) at vascular access sites to avoid a traditional surgical cutdown.

**Materials And Methods:** We retrospectively reviewed our experience of pEVAR between April 2013 and July 2014. Primary success of the procedure was defined as closure of a common femoral artery (CFA) arteriotomy without the need for any secondary surgical or endovascular procedure within 30 days.

**Results:** In total there were 10 pEVAR cases performed in the study period, one case in Queen Elizabeth Hospital during visiting vascular service. Patients have a mean age of 73.4 year old (66-77 year old) The mean abdominal aortic size was 7.2 cm (5.6-10.0cm). Mean femoral artery diameter was 9.0 mm on the right and 8.9 mm on the left. Mean duration of surgery was 119 minutes (98- 153 minutes). 50% of patients were discharged at post-operative day one, 30%- day two and 20%- day three. Primary success was achieved in 9 patients (90%) or in 19 CFA closures (95%). No major complication was reported.

**Discussion:** We believe that with proper selection of patients undergoing EVAR, pEVAR offers a better option of vascular access with shorter operative time, less post-operative pain, shorter hospital stay and minimises the potential complications of a conventional femoral cutdown.

## KEY WORDS:

*Abdominal Aortic Aneurysm, Endovascular Aneurysm Repair, Percutaneous, Closure Device*

## INTRODUCTION

Abdominal aortic aneurysm(AAA) is one of the most significant cardiovascular diseases. The incidence of AAA in ultrasound-screened populations ranges around 4 to 5%.<sup>1</sup> Mortality of ruptured AAA was reported to be as high as 76.9-90%.<sup>2,3</sup> To prevent emergent presentation of AAA, elective

repair is recommended when AAA diameter reaches 5.5cm.<sup>4</sup> Since the first endovascular aneurysm repair (EVAR) performed by Parodi et al. in 1991, there is a paradigm shift towards endovascular repair of AAA globally.<sup>5</sup> Despite requiring more radiological surveillance tests and secondary interventions, the safety profile of EVAR has been established.<sup>6</sup> EVAR traditionally requires cut-down at both groins to obtain vascular access. The introduction of total percutaneous EVAR (pEVAR) using suture-mediated closure devices(SMCDs) has further decreased the level of invasiveness of EVAR. We report here our initially experience with pEVAR at our centre which represents the largest public vascular centre in Malaysia.

## MATERIALS AND METHODS

We retrospectively reviewed our experience of pEVAR between April 2013 and July 2014 in our centre. We also included cases performed within the visiting hospitals network of our department. Cases performed were identified through the operating theatre registry. Medical records were traced and relevant data collected through a standard performa. Primary success of the procedure was defined as closure of a common femoral artery (CFA) arteriotomy without the need for any secondary surgical or endovascular procedure within 30 days.

In our centre, the preferred SMCD is Perclose Proglide (Abbott Vascular, USA). The deployment of the device for pEVAR is performed in a standard manner. After patient is cleaned and draped, ultrasound guided puncture is performed bilaterally at CFA with the insertion 5F sheath on each side through a small incision between 0.5-1.0 cm. Ultrasound guided puncture is used to ensure the entry into the central lumen of the CFA. Subsequently, a 0.035 guide wire is inserted through the sheath and its intra-arterial position is confirmed through fluoroscopy. The tip of the guide wire is parked at the abdominal aorta.<sup>2</sup> Two pieces of Perclose Proglides are then deployed in sequence after the removal of the 5F sheath over the wire. The devices are deployed at 45 degree on each side of the longitudinal line of the artery. Vascular access is then maintained with the insertion of an 8F sheath over the wire which will normally ensure haemostasis. The same sequence of procedure is done at the contralateral side. The standard EVAR procedure is then

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Fig. 1: Completion angiogram in EVAR.

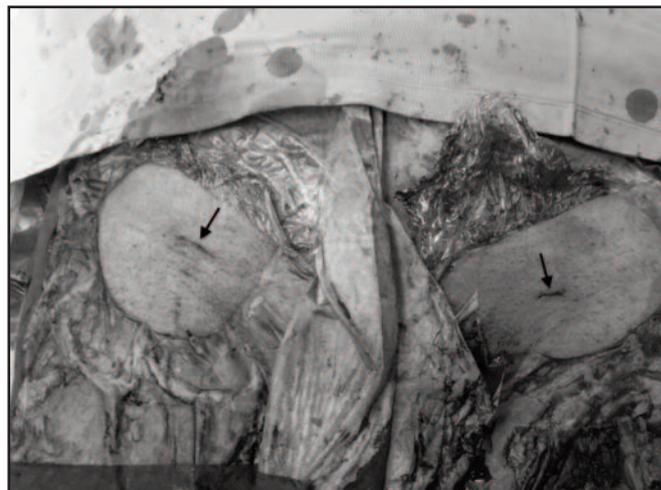


Fig. 2: Post-closure small access wounds in pEVAR.

carried out. (Figure 1) At the end of the procedure, the preformed knot of the sutures of the device are tightened with the provided knot pusher in the same sequence of the initial deployment to obliterate the arteriotomy defect for haemostasis. The wounds are finally opposed with intradermal absorbable suture and sterilstrips.

**RESULTS**

In total, there were 10 pEVAR cases performed in the study period, nine cases were performed in Kuala Lumpur Hospital and one case in Queen Elizabeth Hospital during visiting vascular service. The subjects include the first pEVAR case performed in a Malaysian public hospital, in April 2013 and also the first EVAR case performed in the state of Sabah, in May 2014. All of the subjects are male. They have a mean age of 73.4 years (66-77 years). Risk factors profile includes hypertension in 80%, smoker in 30% and hypercholesterolaemia in 60%. None of them has family history of AAA.

The mean abdominal aortic size was 7.2 cm (5.6-10.0cm). Mean femoral artery diameter was 9.0 mm on the right and 8.9 mm on the left. Mean duration of surgery was 119 minutes (98-153 minutes). Fifty percent of patients were discharged at post-operative day one, 30% day two and 20% day three. Primary success was achieved in nine patients (90%) or in 19 CFA closures (95%). One patient had unsuccessful haemostasis at left CFA, which warranted a surgical cut down for haemostasis. This patient was discharged at post-operative day two. We contribute this to the learning curve of the usage of the device. Upon discharged from hospital, patients were followed up and assessed clinically in addition to a routine protocol of computed tomography (CT) scan at three months, six months and, thereafter, annually. With follow up of more than one year, there is no complication detected at access sites both clinically and through radiological investigation.

**DISCUSSION**

Endovascular intervention is a rapidly evolving field with tremendous advances in techniques and devices technology. Interventionists are striving to be less invasive with the advent of smaller profile devices and usage of closure devices. EVAR traditionally necessitates groin cut-down to obtain vascular access via both CFA. Groin cut-down, however, is associated with possible complications such as haematoma, seroma, lymphoceles and infection that may lead to a significantly longer duration of the hospital stay.<sup>7</sup> In pEVAR, the entire EVAR procedure can be performed through two small (5-10 mm) incisions at the both groins. (Figure 2)

pEVAR involves the usage of SMCDs. The established SMCDs available in the market includes Perclose Proglide and Perclose Prostar XL (Abbott Vascular, USA). In our centre, Perclose Proglide represents the SMDC we are familiar with. A single 6F Perclose Proglide device is often adequate to achieve haemostatic closure of arteriotomy by access sheath up to 12F in size. Larger access sizes will necessitate two or more of such devices to achieve haemostasis. Obesity, calcified femoral arteries, scarred groin, kinking of both iliac arteries and underlying occlusive disease have been reported as anatomical risk factors for inadequate femoral closure of SMCDs and the requirement for conversion to cutdown.<sup>8</sup> There are multiple studies and meta-analysis reporting the efficacy and safety of usage of SMCDs for EVAR.<sup>8,9</sup> In a recent meta-analysis, Georgiadis et al. reported primary success rate of pEVAR at 93.8%.<sup>8</sup> However, the success of pEVAR is dependent on proper patient selection and as well as operator experience. In the event of technical failure of SMCDs, facilities and expertise for femoral cut-down for vascular access must be readily available. The benefits of pEVAR include less bleeding, shorter procedure duration, less postoperative pain, quicker time to ambulation and reduced hospital stay.<sup>8</sup> Reported complications include pseudoaneurysms, arteriovenous fistulas, CFA stenosis and infection but their incidences are infrequent with the

incidence of the latter two around 0.2-0.3%.<sup>8</sup> Although pEVAR will increase the total cost for procedural consumables (RM 800 per piece) but with decreased operative time, Intensive Care Unit and hospital stay, pEVAR is actually more cost-effective in addition to patient's better tolerance and faster recovery from the procedure.

In conclusion, we believe that with proper selection of patients undergoing EVAR, pEVAR offers a better option of vascular access with shorter operative time, less post-operative pain, shorter hospital stay and minimises the potential complications of a conventional femoral cut-down.

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