PERCUTANEOUS BALLOON ANGIOPLASTY IN CENTRAL VENOUS STENOSIS AND OCCLUSION IN HAEMODIALYSIS VASCULAR ACCESS: COMPARISON OF THE OUTCOME

BY:

DR HANIZA BT WAHED

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LIST OF ABBREVIATIONS

CVOD	central venous occlusive disease
AVF	arteriovenous fistula
LIJ	left internal jugular
RIJ	right internal jugular
ESRF	end stage renal failure
PTA	percutaneous transluminal angioplasty
PTS	percutaneous transluminal stenting
CT	computed tomography
MRI	magnetic resonance imaging
CVC	central venous catheter
PTFE	polytetrafluoroethylene
HPP	hospital pulau pinang
SVC	superior venae cava
BCV	brachiocephalic vein
PICC	peripherally inserted central catheter

ABSTRAK

TOPIK: Perbandingan antara keputusan angioplasti dalam salur darah vena utama sempit dan tersumbat dikalangan pesakit hemodialisis.

LATAR BELAKANG: Salur darah vena utama yang sempit atau tersumbat dalam pesakit haemodialisis semakin meningkat memandangkan peningkatan kualiti penjagaan kesihatan dan gaya hidup. Adalah penting untuk merawat keadaan salur darah vena utama sempit dan tersumbat terutamanya dalam pesakit haemodialisis. Keadaan ini akan menyebabkan tekanan yang tinggi dalam salur darah vena dan ini akan menganggu fistula dan akhirnya akan menyebabkan fistula tidak berfungsi dan terpaksa diikat.

Intervensi dalam radiologi semakin berkembang terutamanya dalam rawatan melibatkan salur darah. Ia telah memainkan peranan penting dalam salur darah vena utama tersumbat. Peranan pembedahan semakin berkurangan dan secara tidak langsung mengurangkan beban kerajaan dalam memberikan perkhidmatan penjagaan kesihatan kepada masyarakat.

Walaupun rawatan utama untuk salur darah vena utama tersumbat adalah angioplasti, namun belum ada protokol yang seragam untuk menangani masaalah ini.

OBJEKTIF: Dalam kajian ini, perbandingan antara salur darah sempit dan salur darah tersumbat dilakukan dan kaitan antara tahap kesempitan salur darah dan kepanjangan salur darah tersumbat dengan kejayaan prosedur angioplasti di analisa. Adalah diharapkan agar kajian ini dapat membantu dalam penyediaan protokol yang seragam untuk rawatan salur darah tersumbat dalam pesakit buah pinggang pada masa hadapan.

METODOLOGI: Ini adalah kajian retrospektif tentang rawatan angioplasti dalam masalah salur darah vena sempit dan tersumbat. Kajian di jalankan di Hospital Pulau Pinang untuk tempoh 21 bulan dari Mei 2011 hingga Februari 2013. Nota pesakit dikesan dan data yang dikumpulkan ialah tentang kejayaan prosedur, komplikasi prosedur jika ada, lokasi salur darah utama yang terlibat dan samaada sempit atau tersumbat, Keputusan venogram di kaji sebelum dan selepas prosedur angioplasty dijalankan. Analisa deskriptif di gunakan untuk mengkaji data demograpik.

KEPUTUSAN: 71 pesakit terlibat dalam kajian ini dimana 42 (59.2%) orang adalah lelaki dan 29 (40.8%) adalah perempuan. Umur mereka adalah sekitar antara 17 ke 86 tahun. 21 (29.6%) ialah Melayu, 39 (54.9%) Cina dan 11 (15.5%) adalah dari kaum India. Dari jumlah keseluruhan 71 pesakit, 28 (39.4%) kes dari kumpulan salur darah sempit dan 43 (60.6%) kes adalah dari kumpulan salur darah tersumbat. Dari 28 jumlah kes salur darah tersumbat, 25 kes (89.3%) telah berjaya dalam prosedur angioplasti. Dari jumlah 43 kes salur darah tersumbat, hanya 19 (44.2%) berjaya dalam prosedur tersebut. Tahap kesempitan salur darah mempunyai kaitan dengan kejayaan prosedur angioplasti. Tahap ukur panjang salur darah tersumbat mempunyai kaitan dengan kejayaan prosedur angioplasti.

KESIMPULAN: Kejayaan prosedur angioplasti di dalam salur darah sempit adalah lebih tinggi (89.3%) berbanding dengan didalam salur darah tersumbat (44.2%) dikalangan pesakit hemodialisis. Kejayaan prosedur angioplasti mempunyai hubungan dengan tahap ukur panjang salur darah tersumbat dan tahap kesempitan salur darah.

ABSTRACT

TOPIC: Percutaneous balloon angioplasty in central venous stenosis and occlusion in haemodialysis vascular access: comparison of the outcome.

INTRODUCTION: Central venous occlusive disease is currently increasing in trend, in view of improved health care and lifestyle changes.

Central venous occlusive disease requires treatment, especially in hemodialysis patient. Venous hypertension in this disease interfere the hemodialysis access and eventually leading to its dysfunction and access termination.

Interventional radiology has emerged in endovascular treatment, playing its important role in treatment of central venous occlusive disease. Surgical intervention has been less favourable in the management of central venous occlusive disease, indirectly reduces the health care burden.

The current practice of central venous occlusive disease is an endovascular approach as a frontline. However there is no proper protocol in managing the disease.

OBJECTIVE: In this study, success rate in venous stenosis and venous occlusion were compared and the association of degree of stenosis and length of occlusion with success rate has been studied. Hopefully it will help in predicting the patient which is suitable for endovascular management or surgery and contributing in developing a proper management protocol in the future.

METHODOLOGY: This is a cross sectional retrospective study of percutaneous angioplasty in the treatment of central venous stenosis and occlusion in Hospital Pulau Pinang for period 21 months from May 2011 to February 2013. The patient's notes were traced and data were collected on the success rate, complication rate, presence and location of stenosis, degree of stenosis and length of occlusion. Venograms were reviewed in all cases to assess lesion characteristics, pre procedure and post procedure results. Descriptive analysis was used to analyze the demographic data.

RESULTS: 71 patients were included into this study of which 42 (59.2%) males and 29 (40.8%) females. Their age ranged from 17 to 86 years old. 21 (29.6%) were Malay, 39 (54.9%) Chinese and 11 (15.5%) are Indian. From total 71 patients, 28 (39.4%) cases are were venous stenosis and 43 (60.6%) cases were venous occlusions. 25 out of 28 cases of venous stenosis were successfully treated with success rate of 89.3%. 19 out of 43 cases of venous occlusion were successfully treated with success rate of 44.2%.

There is association between the success rate of procedure and degree of stenosis and length of occlusion.

CONCLUSIONS: The success rate of percutaneous angioplasty in central venous stenosis is higher (89.3%) compare to total venous occlusion (44.2%) among haemodialysis patient. The degree of stenosis and length of occlusion is significantly associated with the success rate of percutaneous balloon angioplasty.

1.0 INTRODUCTION

1.0 INTRODUCTION

The term central venous occlusive disease (CVOD) refers to occlusion or significant stenosis involving big intrathoracic vein. The stenosis becomes significant when the diameter is less than 50% of the normal calibre and causes obstruction. The main causes of central venous occlusive disease are central venous cathetherization, high pressure flow in arteriovenous fistula and anatomical compression by the adjacent structure. Central venous occlusive disease is a major problem in hemodialysis patient because of the hypercirculation. The usual presentation is ipsilateral arm, neck and facial swelling. It is important to maintain the function of arteriovenous fistula (AVF) in end stage renal failure patient and the aim of treatment in central venous occlusive disease is to relieve the symptoms and prevent hemodialysis access failure.

The management of central venous occlusive disease is still vague. Usually the treatment is individualized and based on hospital settings and clinician. Standard optimal treatment protocol is needed to be established in the future. Treatment of central venous occlusive disease should be initiated when the diameter is reduced by more than 50% and is accompanied by reduction in access flow, difficult cannulation, painful arm oedema or prolonged bleeding after removal of cannula.

In the past, treatment of central venous occlusive disease is surgery or ligation of the AV fistula. Usually patient symptoms will improve dramatically after fistula ligation. However, vasculopathy in these patients make the creation of another AV fistula as a major

challenge to the vascular surgeon. Difficulty in establishment permanent access is usually due to stricture of contralateral veins from prior catheter placement. Surgical treatment has high morbidity and mortality with high cost for surgery and hospital stay.

Recently, the treatment of central venous occlusive disease has shift to endovascular treatment even though the rate of restenosis is significant. Surgery is only considered when failure of endovascular treatment occurred. Ligation of the AV fistula is the last resort since creating another AV fistula is difficult and challenging in end stage renal disease (ESRD) patient. Thus, transluminal angioplasty is the preferable management for central venous occlusive disease even though the restenosis rate is high. Fortunately, endovascular treatment is able to maintain vascular access for a substantial period of time. (Patrick Haage et al. 1999). This will avoid patients from becoming catheter dependent dialysis access.

Decision in treating long segment central venous occlusive disease is still in dilemma. Some study suggests surgical intervention while other recommendation is still radiological intervention. However, there are no studies available in proving the superiority of the treatment. In short segment stenosis less than 2cm, endovascular treatment has good outcome in comparison with stenosis more than 2 cm (D. A Hirsch et al 2002).

This retrospective study is done to compare the outcome of endovascular treatment in central vein stenosis and occlusion. The association of degree of stenosis and length of occlusion with success rate will also be determined in this study.

2.0 LITERATURE REVIEW

2.0 LITERATURE REVIEW

2.1 INCIDENCE AND EPIDEMIOLOGY

The prevalence of central venous occlusive disease in patients with ipsilateral hemodialysis arteriovenous fistulas (AVF) is increasing in trends. However, there are no proper statistical data available in Malaysia.

In Singapore, the prevalence of end stage renal disease are increasing in trends .In 2004, there are 2700 patients requiring hemodialysis. The cases are predicted to increase up to 6000 in the year 2010 and there will be great demand and challenges to the vascular surgeons, nephrologists and intervention radiologists (P. Robless et al 2007).

In the past before the introduction of endovascular treatment, patient was started on anticoagulant. This hopefully with time can develop enough collaterals to drain blood so that patient can continue using ipsilateral AVF for haemodialysis (Kwok 2004).

2.2 ANATOMY

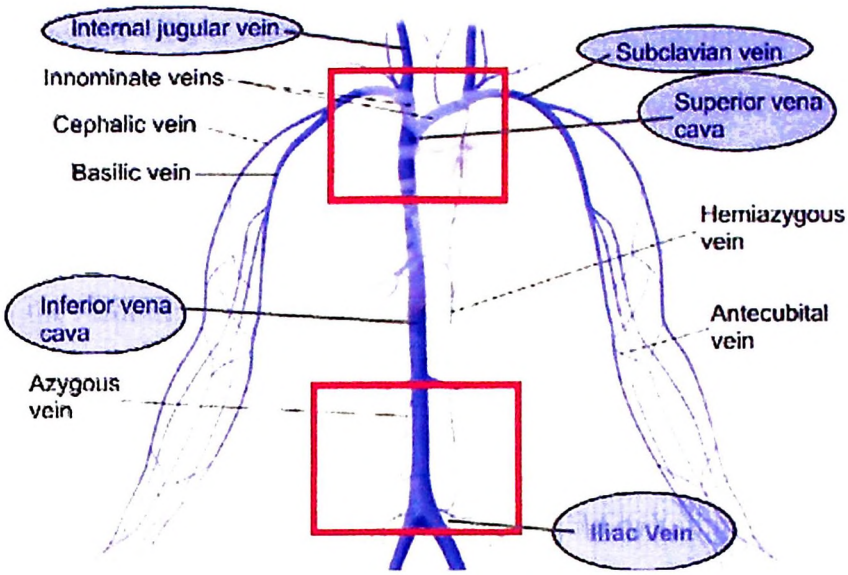

Figure 2.1. Anatomy of the venous system shows central veins (red boxes) in the upper and lower extremities. The designations brachiocephali cand innominate are synonymous.
(Central Vein Stenosis Anil K. Agarwal, MD).
http://onlinelibrary.wiley.com/doi/10.1111/j.1525-139X.2007.00242.x/pdf

Knowledge of central vein and the relationship with adjacent structure is important and helps in understanding why central venous occlusive diseases are common to occur in certain location (Yevzlin, A. S et al 2008).

Awareness and prevention occurrence of central venous occlusive disease are possible by avoiding placement of central venous catheter in the veins that have high risk of developing central venous occlusive disease based on the understanding of the anatomy.

The central veins include subclavian, internal jugular, brachiocephalic veins and superior vena cava. The subclavian vein is the continuation of the axillary vein and its starts at the lateral border of the first rib enters the thoracic inlet posterior to the clavicle and anterior to the first rib and scalenus muscle. The subclavian vein joins the internal jugular vein and become brachiocephalic vein. Right and left brachiocephalic veins join in the mediastinum to form the superior vena cava.

2.3 CAUSES AND PATHOPHYSIOLOGY

There are many causes and risk factors of central venous occlusive disease reported in the journal. The major and important cause of central venous occlusive disease is previous central venous catheter placement. Other contributing factors are hypercirculation, anatomy and external compression, uraemic milleu, dialysis needle and comorbidities (Yevzlin, A. S et al 2008).

2.3.1 Central venous catheter placement

The major risk factor is central venous catheter placement which is common and avoidable while waiting for the vascular access to be matured. Cannulation of veins and insertion of venous access devices have potential to injure the veins and thereby incite phlebitis, sclerosis, stenosis or thrombosis (Yevzlin, A. S. et al 2008). Other procedures that also contribute to central venous occlusive disease include peripherally inserted central catheter (PICC), central venous port catheter, pacemaker and defibrillator wires (Kwok 2004).

Studies have been shown that central venous catheter placement is the main major factor in central venous occlusive disease. About 27% of patient with central venous occlusive disease have history of previous central venous catheter placement (Kundu et al 2009). About 10% to 50% of haemodialysis catheter user develops central venous occlusive disease (Agarwal et al 2007).

The postulated theory is central venous catheter position against the vessel wall which acts as foreign body and eventually inflammation. Movement of the catheter tip or body against vessel wall causes injury to the vessel and will lead to thrombin generation, platelet activation, expression of P-selectin, and an inflammatory response. (Protack et al. 2007).

However, avoidance of central venous cathetherization cannot completely prevent occurrence of central venous occlusive disease. Investigation should be done prior to creation of vascular access especially in patient with history of central venous catheter or patient with cardiac rhythm device. Creation of AV access should not be done on ipsilateral side of cardiac rhythm device because it carries risk of erosion.

2.3.2 Hypercirculation

The other factor that contributes to the development of central venous occlusive disease is disruption of physiological parameter of blood flow. In end stage renal failure there is hypercirculation over a chronic course. High flows and pressure changes during dialysis

may also be an inciting factor. These hemodynamic stresses have shown to cause platelet aggregation and deposition and endothelial hyperplasia. Histopathological examination of diseased vein proves the presence of fibrous tissue as reported by Kwok et al in 2004.

2.3.3 Anatomy and external compression.

Less common cause of central venous occlusive disease which is unrelated to device is external compression (Agarwal 2013). Anatomic consideration is important in catheter placement in order to reduce the contact with vessels as well as physical injury that eventually cause central venous occlusive disease. The best choice for venous access or puncture site for central venous catheter is right internal jugular (RIJ) vein. Study shows that the placement of central venous catheter in subclavian vessel has the highest risk in causing central venous occlusive disease (MS Johnson et al 2000). Nowadays, placement of central venous catheter in subclavian vessel is not a practice anymore.

Yevzlin et al reported that left internal jugular vein (LIJ) is unfavorable and more associated with central venous occlusive disease due to its complex anatomy and tortous course. There are 3 sites of sharp angle in the course of left sided central venous catheter (CVC). There are at the transition from the left internal jugular vein to the left brachiocephalic (innominate) vein, at the midpoint of the left brachiocephalic (innominate) vein as it wraps around the mediastinal vessels, and at the junction of the left brachiocephalic (innominate) vein and the superior vena cava (Yevzlin 2008). Retrospective study on chronic haemodialysis patients in Sarawak, Malaysia in 2003

conclude that left internal jugular catheter and older patients have a higher risk of developing central vein stenosis (Koh 2005).

Ultrasound also demonstrates that the diameter of the left internal jugular vein is smaller than the right internal jugular vein. Longer course and high wall contact will cause increased endothelial injury and stimulate fibrotic pathway, resulting central venous occlusive disease (Agarwal 2013).

Chung et al reported that an important cause of central venous occlusive disease in chronic renal failure patient is extrinsic compression of the left brachiocephalic vein between the arch vessels and the sternum. In chronic renal failure patients, volume overload eventually cause dilatation of the aorta and arch vessels, indirectly reducing the presternal space and compressing on the left brachiocephalic vein (Chung et al. 2003).

Knowing this, early preparation of permanent vascular access before starting hemodialysis is recommended. If catheter placement is needed, the right internal jugular vein is preferable as the site of catheter as it can reduce the incidence of central venous occlusive disease (Yevzlin, A. S et al 2008).

2.3.4 Uraemia

In end stage renal failure, the uraemic milieu causes intimal changes. This occurs even before the construction of arteriovenous fistula. In the absence of arteriovenous fistula, intimal changes in the cephalic vein has support the uremic milieu hypothesis (Yevzlin 2008). This support that uraemic milieu also contribute to pathogenesis of central venous occlusive disease. Mezzano et al reported that uraemia in end stage renal failure patient causes endothelial dysfunction and predispose to venous neointimal hyperplasia. Venous neointimal hyperplasia is characterized by smooth muscle cell/myofibroblast proliferation, angiogenesis (microvessel formation) and matrix deposition (Chaudhury et al. 2003).

2.3.5 Dialysis needle.

Repeated insertion and removal of dialysis needle in the blood vessels causes thrombi formation. This will lead to production of cytokines, platelet –derived growth factor and proinflammatory cytokines, eventually lead to venous stenosis (Albers 1994).

2.3.6 Comorbidities.

In one study of endovascular management of veno occlusive disease in haemodialysis patient reported that if patient with comorbidities such as hypertension, diabetes mellitus and smoking require higher number of intervention due to restenosis (Nael et al. 2009). This proves that multiple comorbidities contribute to the pathogenesis of central venous

occlusive disease. However Koh et al reported that diabetes did not contribute to the development of central venous occlusive disease.

2.4 SYMPTOMS

In nondialysis patients, central vein stenosis is often silent. The symptoms only arise when there is increased flow from an arteriovenous fistula. Patient usually only be symptomatic when increased blood flow from dialysis access occur (Agarwal 2013).

Central venous occlusive disease should be treated when there is symptom of swelling and oedema. Swollen arm and oedematous skin are easily injured and worsened by poor healing process in this group of patients. Swelling and massive edema will eventually lead to thrombosis of the access site. In addition, central venous occlusive disease in haemodialysis patient should be treated to prevent aneurismal dilatation of AV access that eventually needs surgical revision. Elevated venous pressure is one of the indicators of central venous obstruction. Rarely intervention needed, in certain case of developing intracranial hypertension via the collaterals (Renaud et al. 2012).

2.4.1 Swelling and oedema.

The usual presentation of central venous occlusive disease is usually swelling of upper limb, neck and face of ipsilateral of obstruction. If the obstruction occurs at subclavian vein, most commonly patient will present with edema of the ipsilateral extremity and

breast. For innominate vein, the face will also be affected. Swelling develops when the obstruction is severe. In asymptomatic patients, the degree of obstruction is mild and development of collateral helps in draining the blood.

2.4.2 Others symptoms.

Intradialytic reduced access flow is another important symptom. This predispose to access recirculation and dialysis adequacy, associated with elevated urea recirculation more than 15%. Reduced access flow rate is assigned as flow rates measured by a Transonic device of less than 500ml/min (Mezzano et al. 2001). Consequently, there will be elevated dynamic venous pressure (more than 100 mmHg) and prolonged post hemodialysis bleeding.

2.5 TREATMENT

In asymptomatic patient or those with only minimal symptoms of oedema with no pain, inflammation or threatened tissue ischemia, observation is suggested. Angioplasty in this group of patients are associated with rapid stenosis progression and escalation of lesion (Levit et al. 2006). In symptomatic patient, endovascular treatment and surgery are the choices (Jennings et al. 2011).

2.5.1 Surgery

Types of surgical treatment.

The final resort in patient with central venous occlusive disease would be surgical treatment. Surgical options include creation of non anatomical route to bypass stricture. This procedure need major thoracotomy (Kwok 2004). These include direct repair using saphenous vein grafts or ringed polytetrafluoroethylene (PTFE) grafts, jugular vein turndown to bypass a stenosed subclavian vein, or use of surgical techniques to create anastomosis of vein to vein or even vein to the right atrium. Ferrari Ayarragaray reported the use of venous decompression of the femoral vein which is simple with low complication rate. Transposition of the internal jugular vein and anastomosis to axillary vein and extra-anatomic bypass to the external jugular vein procedures have been reported (El- Sabrout RA 1999). Sometimes claviculectomy or median sternotomy is required in surgical intervention because of the intrathoracic position of the vessels involved (Agarwal 2013). Open surgery has success rate of approximately 50% with morbidity about 30% (Bakken et al. 2007). Surgery requires experience and skills. Furthermore, patients are subjected for extended hospitalization and higher mortality rate. It may play a role in younger patients, whose the general health status is fit for major surgery.

If choices are not available, closure of the fistula is the ultimate measures and finally the arm will be excluded for future vascular access. Fistula ligation will give symptomatic relief. However this procedure will sacrifice the functional fistula. If AVF has

to be ligated, recreation of AVF in contralateral limb is usually difficult because of the diseased vein and recurrence of similar problem is very high.

Multiple comorbidities.

Surgery is difficult in patient with end stage renal failure in view of multiple comorbidities that will increase the risk of mortality and morbidities. The healing process in this group of patient is slow contributing by the age and low immunity. The clinicians usually try to avoid major procedure because of the poor prognosis.

Hospital stay.

Major surgical procedure requires prolonged hospitalization and associated with hospital acquired infection leading to morbidity and mortality. This also contributes to increase medical burden nationally and individually. Fortunately endovascular management is done as an outpatient basis. Dialysis can be performed immediately post vascular intervention.

2.5.2 Endovascular treatment

Nowadays endovascular treatment is the mainstay of treatment before considering surgical approach or final option of fistula ligation and creating a new access route. There are many options for endovascular treatment. The main option includes balloon angioplasty, stenting, endovascular irradiation and stent graft. Newer technique such as drug eluting stent and cutting balloon are still under research and assessment (Kwok 2004).

Percutaneous balloon angioplasty.

The technique of percutaneous transluminal angioplasty was first described by Dotter and Judkins in 1964. However modification and introduction of angioplasty balloon is introduced by Grüntzig (Robless et al. 2007). The endovascular treatment for central venous occlusive disease only starts in mid 1980s (Bakken et al. 2007).

This treatment is the main practice worldwide, eventhough it provides only provides temporary relieve. Recurrent symptoms will subject patient for frequent percutaneous transluminal angioplasty. However this treatment is feasible, convenient for the patient with no major complication and is recommended as the preferred treatment.

In one of the study of central thoracic veno-occlusive disease in haemodialysis patient; stenosis was graded as mild stenosis with less than 30% luminal narrowing, significant stenosis with luminal narrowing of 30% to 99% and total occlusion (Kambiz Nael et al 2009).

Kambiz Nael further reported that technical success was defined as successful procedure without residual stenosis or complication, functional dialysis access and clinical improvement. When the residual stenosis more than 30% or inability to cross or dilate the diseased vessels technical failure are considered.

Endovascular irradiation.

Endovascular irradiation is helpful in suppression of intimal hyperplasia in case of post angioplasty of coronary artery which proven to prolong the patency. Unfortunately, this does not apply to central vein, probably due to different response of artery and vein. Future research is needed to explore this treatment (Kwok 2004) .

Stenting.

There is no difference seen in patency rate of post transluminal angioplasty (PTA) and post transluminal stent (PTS). PTS does not improve on the patency rates more than PTA and does not add to the longevity of ipsilateral hemodialysis access sites (Bakken, Protack et al. 2007). Usually percutaneous transluminal stent is considered when percutaneous transluminal angioplasty fail due to elastic recoil or when recurrence occur within 3 months following surgery (Kwok 2004).

Drug eluting stent.

Future treatments include drug eluting stents with rapamycin or paclitaxel or coated stent to improve endothelial healing inside the stent. In drug eluting stent, its close proximity to the vessel wall is an advantage making the action of the drug possible and suppresses intimal hyperplasia. However, reendothelization can still occur (Kwok 2004).

Cutting balloon.

Evolution of the balloon angioplasty has result in invention of cutting balloon. After 2003, cutting balloon were used in PTA-resistant lesion. It has 4 blades/atherotomes that are embedded in the balloon. After inflation of the balloon, the atherotomes will expand radially and help the dilatation of the diseased vein by causing longitudinal

microsurgical incisions to the vessel wall. This will be helpful in elastic and fibrotic structure (Kwok 2004) . Another advantage is during angioplasty, a lower pressure is enough for the procedure. This will reduce the venous stress and subsequent intima hyperplasia. The theoretical advantage of cutting balloon is it induce fewer endothelial injuries and therefore, less vigorous proliferative response after angioplasty. Some of the researches on cutting balloon angioplasty against conventional reveals no difference in 6 months primary patency rates.

Although endovascular treatment plays a major role in the treatment of central venous occlusive disease, its temporary relief is a disadvantage. Usually patient will return back with similar complaints. Intimal hyperplasia is the postulated cause. Despite of temporary symptomatic relief, it is worthwhile as it maintains the AVF function (Sprouse, et al. 2004). This is important because of difficulty in getting of vascular access in end stage renal disease, limiting the creation of alternative vascular access.

2.6 DIAGNOSIS OF CENTRAL VENOUS OCCLUSIVE DISEASE

2.6.1 Conventional angiogram.

The gold standard of diagnosis of central venous occlusive disease is by conventional venogram. Limitation and disadvantage of central venogram include risk of nephrotoxicity, allergy reaction, radiation exposure and multiple access site needed to assess different drainage system (Shinde et al. 1999). In patients whom have not started dialysis therapy, minimal amount of iso-osmolar contrast media can be used safely.

2.6.2 Computed tomography (CT) venogram.

The advantages of ct venography include ability to assess proximal extent of obstruction, greater contrast resolution and can provide three dimensional images. These are useful information for treatment planning, thus useful as diagnostic imaging (Chung et al. 2003).

Chung et al also reported the disadvantage of ct venogram include use of iodinated contrast, radiation and artifact during contrast administration. Technical limitations of CT venography include difficult venous puncture, low spatial resolution, beam hardening artifact and flow artifact.

2.6.3 Ultrasound Doppler.

Limitation of ultrasound Doppler is obscuration of venous structure with adjacent bone and lung parenchyma (Shinde et al. 1999). Obese individual is more difficult due to overlapping soft tissue. It is also operator dependant. However, it is cheap, noninvasive and repeatable without radiation issues (Labropoulos et al. 2007).

Color flow duplex ultrasonography avoids the use of contrast media. Central venous occlusive disease should be suspected when there is an absence of respiratory variation in vessel diameter, lack of polyphasic atrial waves, and presence of collateral vessels (Agarwal 2013).

2.6.4 Magnetic resonance imaging (MRI)

Previously, magnetic resonance angiography has been used to evaluate central venous occlusive disease. However in patient with chronic renal disease, there is a risk of nephrogenic systemic fibrosis after gadolinium. Time-of-flight magnetic resonance angiography, can be used to visualize veins without exposure to contrast media (Agarwal 2013).

2.7 PROTOCOL

Worldwide.

No established protocol for the management of central venous occlusive disease. The management is still depends on the common practice of the different hospital setting. The usual practice is balloon angioplasty, followed by stent in situation whereby recoil occur after angioplasty (Kwok 2004) .

Malaysia

In Malaysia, intervention radiology is still new. Specific protocol for the management is not available. Usual practices are based on patient's condition, hospital setting and the availability of intervention radiologist. Further researches are needed in order to develop a proper protocol.

2.8 OTHER STUDIES

Many studies were done on central venous occlusive disease. Most of the studies were done on primary and secondary patency of the veins after endovascular management and comparing the outcome of percutaneous transluminal angioplasty (PTA) and percutaneous transluminal stent (PTS). Some researches were done on causes of the central venous occlusive disease, value of treatment of asymptomatic central venous occlusive disease, comparing surgical management and endovascular approach and the new cutting balloon.

Study on long term outcomes of primary angioplasty and primary stenting of central venous stenosis in haemodialysis patients conclude no difference in cumulative access survival between percutaneous transluminal angioplasty (PTA) and percutaneous transluminal stent (PTS) group (Bakken et al. 2007). Study on endovascular treatment of central venous occlusive disease in patients with dialysis shunts and the primary patency and long term result. Kocher et al reported that primary post PTA patency rate was 70% at 3 months, 60% at 6 months and 30% at 12 months.

Kambiz Nael reported in Journal of vascular and interventional radiology on a study of single institutional experience in 69 consecutive patients. The analysis is on technical success rate and primary patency rates. The success rates for initial and subsequent interventional procedure are 90% and 96% respectively.

Study on asymptomatic central venous occlusive disease demonstrate rapid stenosis progression and escalation of lesion if treated with percutaneous transluminal angioplasty compared with conservative treatment (Levit et al. 2006). Y.C. Kim et al reported that there was no significant difference in patency between PTA and stent placement.

In Malaysia, a retrospective study was done on chronic hemodialysis patients in Sarawak in 2003 on the risk factors and treatment outcome. The study concludes that left internal jugular catheter placement and old age are associated with high risk occurance of central vein stenosis. Percutaneous transluminal angioplasty and stenting are feasible with short term improvement (Koh and Tan 2005).

3.0 AIM AND OBJECTIVE

3.0 AIM AND OBJECTIVE

3.1 AIM

The aim of this study is to compare the success rate of angioplasty in central vein stenosis and occlusion.

3.2 OBJECTIVE

3.2.1 General objectives

To compare the outcome of balloon angioplasty procedure between central venous stenosis and occlusions.

3.2.2 Specific objectives

1. To compare the angiographic parameters between central vein stenosis and central vein occlusion post angioplasty.
2. To determine association the degree of stenosis (%) pre angioplasty with post angioplasty angiographic parameters.
3. To determine association the length of occlusion pre angioplasty with post angioplasty angiographic parameters.