

Pressure vascular-access massage reduces vascular access problems

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Abstract

Objective: We have developed a massage technique for manually dilating stenoses before dialysis puncture, which we have termed “pressure vascular-access massage” (PVAM). We investigated the effect of PVM on parameters including stenosis diameter and vascular access flow volume (VAFV), and whether it extended the duration of vascular access (VA) patency.

Patients and Methods: Out of 120 dialysis patients treated at our clinic, the study subjects were 15 patients with arteriovenous fistula (AVT) who had required vascular access intervention therapy at least twice. PVM of the stenotic area was carried out for 1 min before puncture for tri-weekly dialysis; before and after the procedure, stenosis diameter, VAFV, pulse index (PI), and resistance index (RI) were measured by ultrasonography. Differences in the duration of VA patency depending on whether PVM was performed were also compared.

Results: Stenosis diameter and VAFV increased significantly after PVM ($p < 0.05$). Long-term VA patency was also significantly extended ($p < 0.05$).

Conclusion: Pre-puncture PVAM in the dialysis room may contribute to improving VA management.

Background

Many dialysis patients experience repeated restenosis of the vascular access (VA) created to maintain flow volume (FV) for dialysis. Vascular access intervention therapy (VAIVT) is currently the first-choice treatment for VA problems, and is a comparatively simple form of treatment. However, new measures are still required for patients who experience repeated restenosis requiring frequent VAIVT. We have therefore developed a VA massage technique for use in regular dialysis rooms to encourage venous distension as part of VA management.

The technique involves a member of the dialysis room staff (technician or nurse) manually applying pressure to encourage the distension of the stenotic vessel for 1 min before dialysis puncture, a procedure we have termed “pressure vascular-access massage” (PVAM).

In this study, we evaluated the short-term effect of PVM on parameters including stenosis diameter and vascular access flow volume (VAFV), and investigated whether it improved the duration of VA patency.

Methods

PVM technique

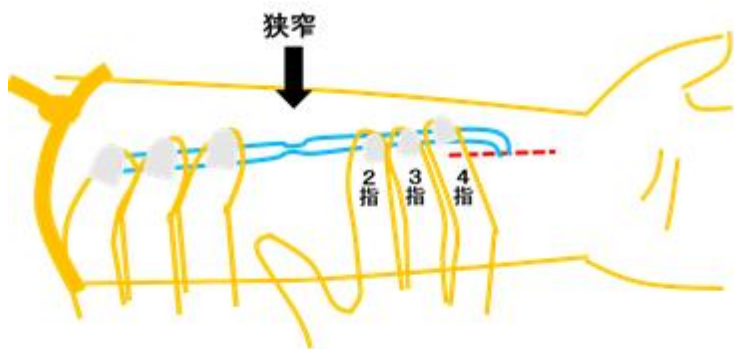
The PVAM technique is illustrated using a balloon model.





A long, thin balloon is constricted at one point. Both hands are placed on the balloon, one on either side of the constriction, and the left hand is used to squeeze the balloon above the constriction. The right hand is pressed down to prevent the air from leaving the balloon, which is thus distended by the pressed-down air. This causes the constriction to dilate, and repeating the process eliminates it entirely.

PVAM can be used to distend the blood vessel by this type of simple pressure. As shown in the diagram of the arm below, a tourniquet is placed centrally to the stenosis and the central side of the VA is compressed with the left hand to shut off blood flow completely. The right hand is placed on the other side of the stenosis and used to push blood up into it from the peripheral side, causing it to distend. This massage is carried out for 1 min by a member of the dialysis room staff before dialysis puncture.



Translation of text in figure above:

Stenosis

Index finger

3rd finger

4th finger

Ultrasonography

VAFV was measured by a LOCIQ e ultrasound unit (GE Medical Systems).

Patients

Out of 120 dialysis patients attending our clinic, the study subjects were 15 patients with arteriovenous fistula (AVT) who had required VAIVT at least twice.

Measurement and comparison of stenosis diameter and VAFV before and after PVAM

Stenosis diameter, VAFV, pulse index (PI), and resistance index (RI) were measured and PVAM was then performed for 1 min, after which stenosis diameter, FV, PI, and RI were measured again.

Differences in the values measured before and after PVAM were compared using a paired t-test, with $p < 0.05$ regarded as significant.

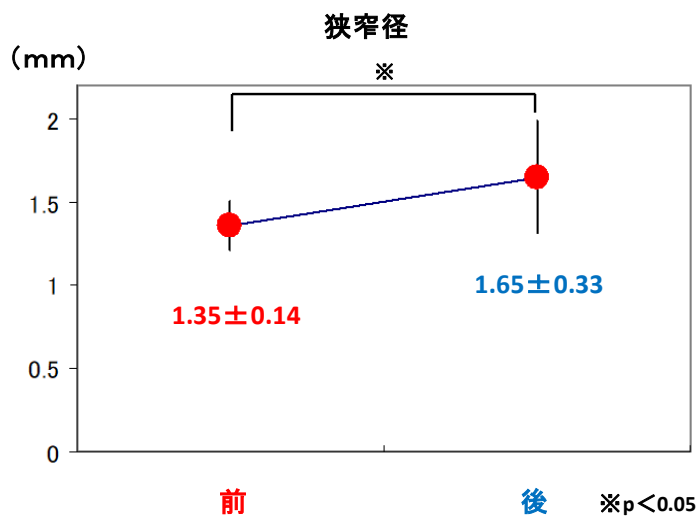
Comparison of patency rates before and after PVAM

The shunt patency rates during the 1-year period preceding the first use of PVAM and for the subsequent 1-year period were calculated and compared using the Kaplan-Meier method, with $p < 0.05$ regarded as significant.

Results

Results 1

Stenosis diameter increased significantly after PVAM ($p < 0.05$).



Translation of text in figure above:

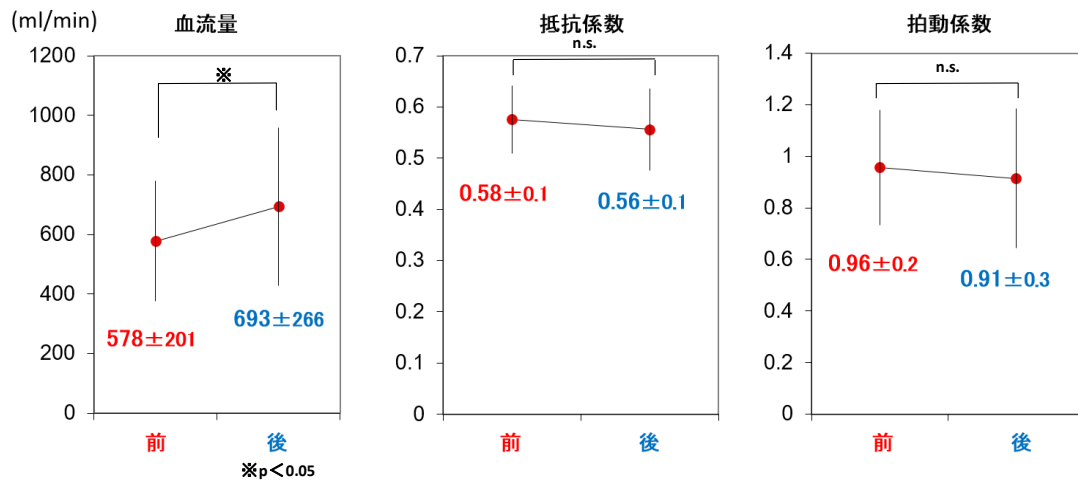
Stenosis diameter

Before

After

* $p < 0.05$

Results 2



Translation of text in figure above:

Flow volume

Resistance index

Pulse index

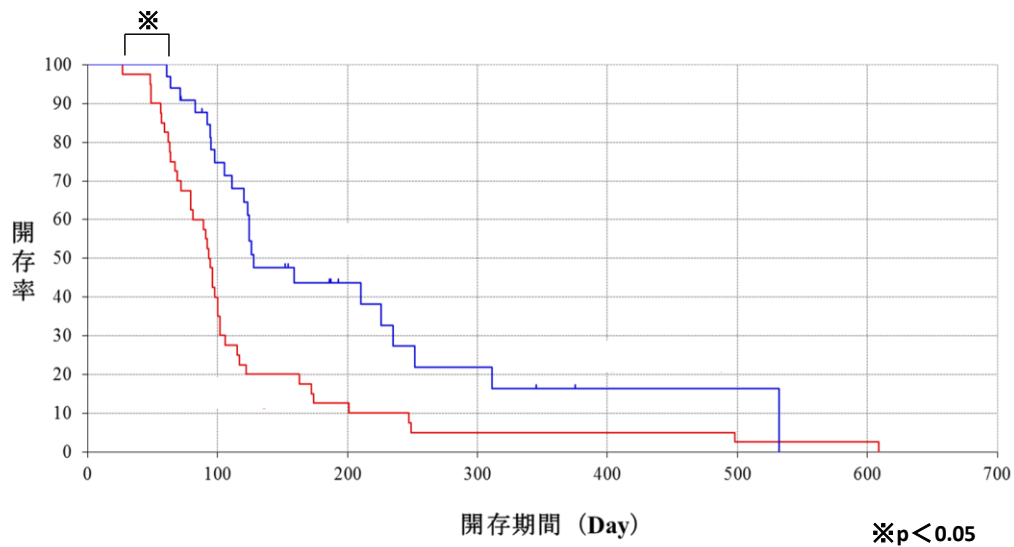
Before After Before After Before After

* $p < 0.05$

FV increased significantly shortly after PVAM ($p < 0.05$).

Both RI and PI also improved, but these differences were not significant ($p > 0.05$).

Results 3



Translation of text in figure above:

Patency rate

Duration of patency (days)

* $p < 0.05$

The duration of patency was significantly extended by PVAM ($p > 0.05$).

Discussion

Although VAIVT has been well reported, few studies have addressed VA massage. There have been a number of negative reports of VA massage causing peripheral arterial thrombosis in the treatment of patients with VA occlusion.^{1,2} We recommend that pressure massage only be performed for unobstructed VA in which no thrombi are present. The absence of thrombi means that massage can be performed safely.

Veins easily dilate and become distended with the application of only a small amount of pressure, such as from a tourniquet. Our results showed that PVAM increased FV without the need for VAIVT. When PVAM was continued tri-weekly, it had a long-term effect in extending VA patency. This is the first study to show that massaging stenotic areas is a good VA management technique.

Which patients are suitable for this technique? This study was restricted to AVF patients, many of whom suffer from poor blood removal due to stenosis immediately above the forearm anastomosis. The lack of subcutaneous fat makes these forearm stenoses easily accessible to pressure by PVAM,

meaning that the veins are readily distensible. This suggested that PVAM may be recommended in AVF patients with poor blood removal.

PVAM is also recommended in patients with immature VAs. Manual distension accelerates the rate of VA development. In some of our patients, the use of PVAM resulted in FV reaching an adequate level, enabling its discontinuation with no need at all for VAIVT. This experience suggests that PVAM may be effective in patients with immature development.

What of patients with artificial vessels (arteriovenous grafts)? Stenosis tends to occur in the vicinity of the anastomosis between the graft and the vein, and as this is usually in the upper arm, where the vein is surrounded by fat, PVAM is unlikely to be effective. Our experience is that the technique is not generally effective in overweight patients. Applying pressure with PVAM may be more useful in thinner patients with less fat around the stenosis, and in such cases it is well worth trying. The technique is not recommended for patients with indwelling stents, however, as repeated PVAM may break the stent.

The vein used for VA is palpable beneath the skin. In patients who have repeatedly undergone VAIVT, rather than just doing nothing until stenosis recurs, we recommend massaging the VA at the bedside of the regular dialysis room. This massage requires no particular location or equipment, and can therefore be used by any dialysis institution. Only taking action when a problem arises with VA management has its limitations. Carrying out regular management with the collaboration of dialysis-room staff may reduce problems with VA.

References

1 . J Vasc Access. 2007 Apr-Jun;8(2):120-2.

Massaging thrombosed PTFE hemodialysis access graft - recipe for disaster.

Shrestha BM1.

2 . Hemodial Int. 2014 Apr;18(2):535-9. doi: 10.1111/hdi.12118. Epub 2013 Nov 26.

Thrombosed hemodialysis access as an unusual source of emboli in the upper extremity of a kidney transplant recipient.

Kim MH1, Hwang JK, Chun HJ, Moon IS, Kim JI.