The May—Husni Procedure: A Reappraisal

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WHAT THIS PAPER ADDS
The May—Husni procedure is not a widely accepted method for venous bypass because of the small numbers of patients with extended isolated obstruction of the femoral vein and strict criteria for the operation. Every new experience in this field adds more information to the understanding of the procedure and status of those patients who require surgery.

Objectives: The May—Husni procedure is a rarely used saphenofemoral venous bypass because of the small number of patients with post-thrombotic segmental femoral vein obstruction alone and the lack of validated selection criteria. There are only a few institutional series reporting the use of this technique. The purpose of this report is to present the author’s experience and critically review the literature.

Methods: Within a 13 year period 12 patients with venous claudication, skin pigmentation, and severe pain and swelling of their legs underwent the May—Husni procedure. Their median age was 57 years (41—69 years). Imaging showed segmental venous obstruction of the femoral vein in all patients and poor or no inflow from the deep femoral vein. Two patients were lost to follow up and the remaining 10 patients were reviewed with a median follow up of 60 months (26—72 months).

Results: The saphenopopliteal bypass remained patent in all patients at follow up. The development of reflux of the saphenous conduit in four patients did not affect the clinical improvement. Venous claudication resolved, hyper-pigmentation improved, and pain was relieved in all patients. Recanalization of the femoral vein 3 years following thrombosis was followed by recurrence of the post-thrombotic symptoms in two patients.

Conclusions: These results indicate that a highly selected subgroup of patients with severe symptomatic post-thrombotic syndrome secondary to chronic segmental obstruction of the femoral vein do well after the May—Husni procedure. In order to refine the criteria for the selection of patients who may benefit from this operation, there is a need for more studies that use a combination of hemodynamic and validated scales that diagnose and grade the severity of post-thrombotic syndrome.

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INTRODUCTION
In the vast majority of patients with post-thrombotic syndrome, conservative management is sufficient to provide symptomatic improvement. A small number of patients with severe symptomatic post-thrombotic changes are suitable for invasive interventions such as the popliteal—common femoral vein bypass procedure. This type of procedure is not widely known or accepted.1,2

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In 1954 Warren and Theodore Thayer were the first to suggest a bypass procedure for cases of severe symptomatic isolated obstruction of the femoral vein.1,2 In a series of 14 patients the great saphenous vein (GSV) was transected at the popliteal level and was anastomosed with the popliteal vein. This saphenopopliteal vein bypass resulted in an improvement by relieving the symptoms of post-thrombotic syndrome (PTS) in 71% of the patients. Despite the good results, the operation did not receive wide recognition, and for 16 years there have been no further publications about the technique. In 1970 Husni, May and Frileux revised the operation. Husni was the first to perform the anastomosis between the GSV and the posterior tibial vein in cases of extended obstruction. He also performed an arteriovenous fistula to improve the patency of the bypass. Since then, this operation has been closely linked with their names.2,3
There are several restrictions when selecting patients to undergo the May–Husni procedure. This operation is only possible if the GSV and the saphenofemoral junction remain fully patent and in addition the common femoral and popliteal veins are spared from post-thrombotic changes and are patent. However, patients with segmental severe obstruction of the femoral vein alone are uncommon, as the post-thrombotic changes tend to be extensive in the lower extremities in patients with severe symptomatic disease who require surgical intervention.

The purpose of this report is to present the author’s experience with the May–Husni procedure and to critically review the literature.

**MATERIALS AND METHODS**

During 1999–2012, 1,950 patients with post-thrombotic disease were seen in the department. Only 12 patients were identified with segmental femoral vein obstruction alone, who were suitable for saphenopopliteal bypass using the saphenous vein in situ. There were two women and 10 men. The median age was 57 years (41–69 years) and they were operated on 2–5 years after the acute deep vein thrombosis.

The patients’ clinical severity class as per CEAP (Clinical, Etiological, Anatomical and Pathophysiological) classification was C4a in six patients and C4b in six patients. All patients were symptomatic with pain and described venous claudication. None had leg ulcers. Post-operatively the degree of pain, cramps, heaviness, venous claudication, edema, and hyper-pigmentation was assessed subjectively by the patient as completely resolved, improved, same/worse.

Patients had extensive post-thrombotic severe obstruction of the femoral vein that had been identified by Duplex ultrasound and phlebography of the lower extremities. The morphological findings of post-thrombotic multi-channels with low venous flow in the femoral vein were considered to constitute hemodynamically significant obstruction. No hemodynamic measurements were performed.

Decreased venous outflow was also visualized in the deep femoral vein, which was not considered to be an effective collateral pathway in all patients (Fig. 1). Patients who were operated on fulfilled the following inclusion criteria: severe signs (≥ C4) and symptoms including significant pain, severe segmental obstruction of the femoral vein, patent common femoral vein, and iliofemoral venous outflow, patent popliteal vein (Fig. 2) with adequate inflow from the calf, competent and patent great saphenous vein, and severe post-thrombotic changes of the profunda vein with impaired flow. The median diameter of the GSV at the time of surgery was 6.7 mm (range: 5.3–7.8 mm).

All procedures were performed by a single experienced surgeon (E.S.) under spinal anesthesia. A longitudinal incision was made in the medial lower third of the thigh. The popliteal vein was dissected. The GSV was transected, and its diameter was measured and patency confirmed. The GSV was anastomosed end to side to the popliteal vein. Because of a fear that secondary GSV dilation with time would compromise the outcome, a Vedensky spiral was placed through a separate incision at the saphenofemoral confluence to prevent dilation and subsequent incompetence of the pre-terminal and terminal valves in four patients later in the study (Fig. 3). No arteriovenous fistula was performed in any of the cases.

In the post-operative period all the patients received anticoagulant treatment with low molecular weight heparins in therapeutic doses (Enoxaparin sodium or Nadroparin calcium) and then started on warfarin for 3 months. The target level of the international normalization ratio was...
between 2 and 3. Anticoagulation was stopped after 3 months because of absence of thrombophilia and other hypercoaguable conditions or permanent risk factors to develop recurrent deep vein thrombosis. Compression therapy was performed using Class II compression stockings (23–32 mmHg; RAL-GZ 387 standard). Patients were encouraged to mobilize early on the first day after the operation.

RESULTS

Two patients were lost to follow up. Thus, long-term results were recorded in 10 of the 12 patients. The median follow up was 60 months (26–72 months). All 10 patients showed symptomatic improvement. The outcomes are shown in Table 1. There was no peri-operative mortality or morbidity. The post-operative length of the stay was 1–3 days.

In all patients the Duplex ultrasound showed a patent GSV during the whole period of follow up. However, the development of GSV incompetence was observed in four non-Vedensky patients after 1.5–2 years. Apart from GSV incompetence, there was no deterioration in clinical outcome with time. The GSV remained competent without venous reflux in all four patients with a Vedensky spiral.

At 1 year, two patients showed a temporary improvement. After this initial improvement, all their symptoms recurred. A venous duplex scan revealed signs of significant recanalization in the femoral vein associated with deep venous reflux. These patients were considered as possible candidates for deep vein valve reconstructive surgery; however, none of them came back for further treatment.

DISCUSSION

Despite the current progress of reconstructive surgery for deep veins, the May—Husni operation still has a limited role in the management of patients with severe post-thrombotic syndrome. The accumulated published experience in the past 60 years includes only 146 May—Husni operations and the published series have only a very small number of patients each.2,3,7,8

In 2013 D.M. Coleman published a review of the May—Husni procedures.2 Clinical improvement varied from 42% to 100% (Table 2).

The large variation in clinical improvement is apparently the result of different and subjective outcome measures in the published series, no quality of life assessment, and incomplete information on the indications and the timing for the procedures. The introduction and validation of the Villalta scale to diagnose and grade the severity of PTS provides a valuable tool to standardize the reporting of outcomes for May—Husni procedures, but was not used in this study or in previous publications.14

The results in this study are similar to other series of a good response to the treatment as stable clinical improvement was observed in 10 out of 12 patients (83%) (retention of achieved improvement of symptoms during the period of follow up). However, patients with ulcerative skin changes were not part of this study (C5—C6), as was the case for Coleman and AbuRahma, which makes it impossible to predict the effectiveness of saphenopopliteal bypass in those patients in this study.

This study indicates that a stable obstruction of the femoral vein without later recanalization is an absolute requirement for a beneficial outcome in saphenopopliteal bypass surgery. It has been reported in previous studies that the post-thrombotic process is completed within 3 months to 2 years after deep vein thrombosis.15 However, in two of the patients, recanalization of the femoral vein was observed 3 years after deep vein thrombosis. This resulted in the development of significant deep femoral venous reflux, which caused deterioration in the clinical condition in spite of a patent bypass.

The hemodynamic profile of the patient who is most likely to benefit from the May—Husni procedure has not yet been studied in detail. AbuRahma et al.4 reported that low maximal venous outflow, normal and mild shortening of the refill time, external compression of the iliac vein, and venous claudication were clinical predictors that correlate with good clinical outcome after veno-venous bypasses, but they cannot be used as selection criteria. It could be useful to record the pre-operative pressure gradient between the popliteal and common femoral vein at rest and with exercise after 10 tiptoe movements and investigate whether these static and dynamic pressure measurements correlate with clinical improvement.16
Another controversial issue is whether or not an incompetent GSV is a useful conduit for the management of these patients. AbuRahma et al.\(^4\) warned against the use of an incompetent GSV, which can increase venous hypertension. Coleman et al.\(^2\) disputed this opinion and reported that even an incompetent GSV can provide an adequate collateral route for blood outflow in patients with severe symptomatic post-thrombotic changes of the femoral vein. Coleman pointed out that the development of incompetence of the GSV, caused by the pressure of its increasing functional load, does not lead to the deterioration of clinical results. In this study incompetent GSVs were not used to create the bypass. However, the development of GSV incompetence in four patients was observed with time and that was the reason for placing a Vedensky spiral in order to prevent GSV dilatation and incompetence in the following four patients. In these patients competence of terminal and pre-terminal valves were preserved with time, as was shown on duplex ultrasound. In spite of similar results in patients with and without a Vedensky spiral, further observations are required to define the role of GSV incompetence and the necessity of Vedensky spiral placement in long-term outcomes.

This study has several limitations. It is a retrospective non-randomized study with a small number of patients who had been treated at the time when the standardized severity scoring scale was not widely accepted. It also only employed Duplex ultrasound and phlebography to investigate the venous system. It is obvious that indications for saphenopopliteal venous bypass are still not clear. The experience of this study shows that patients with a combination of extended femoral vein obstruction and impaired deep femoral venous outflow may benefit from the May–Husni procedure. The presence of severe post-thrombotic signs and symptoms affecting the patient’s quality of life and unresponsiveness to conservative treatment could be considered as indications for saphenopopliteal bypass. The improvement of the inflow (popliteal vein endophlebectomy, arteriovenous fistula) or the outflow of the bypass (common femoral vein endophlebectomy, iliac vein stenting, femoro-femoral crossover venous bypass) has the potential to enhance the patency of the May–Husni procedure.\(^2\) Raju et al.\(^17\) have reported in a recent series of 39 patients that percutaneous stenting of iliac vein obstruction associated with femoral vein occlusion yields significant clinical relief. The same group pointed out that iliac veins should be examined precisely with up to date technology, as overt or occult iliac vein lesions could be a contributor to the symptoms in this setting.

In conclusion, the May–Husni procedure may be indicated in a small number of highly selected patients with severe symptomatic post-thrombotic syndrome unresponsive to conservative treatment. Future studies in high volume venous centers will help to better define the role of this operation.

**CONFLICT OF INTEREST**

None.

**FUNDING**

None.

**REFERENCES**


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**Table 2.** Review of the May–Husni procedures.

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of patients</th>
<th>AVF(^a)</th>
<th>Follow up (months)</th>
<th>Clinical improvement (%)</th>
<th>Bypass patency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warren(^6) (1954)</td>
<td>14</td>
<td>—</td>
<td>23</td>
<td>71</td>
<td>57</td>
</tr>
<tr>
<td>Husni(^10) (1970)</td>
<td>20</td>
<td>—</td>
<td>?</td>
<td>70</td>
<td>69</td>
</tr>
<tr>
<td>Frileux(^11) (1972)</td>
<td>23</td>
<td>—</td>
<td>?</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>Dale(^12) (1979)</td>
<td>6</td>
<td>—</td>
<td>?</td>
<td>50</td>
<td>?</td>
</tr>
<tr>
<td>Husni(^10) (1983)</td>
<td>27</td>
<td>—</td>
<td>12–132</td>
<td>78</td>
<td>63</td>
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<tr>
<td>Gruss(^13) (1985)</td>
<td>12</td>
<td>8</td>
<td>?</td>
<td>42</td>
<td>?</td>
</tr>
<tr>
<td>Danza(^6) (1991)</td>
<td>8</td>
<td>2</td>
<td>?</td>
<td>75</td>
<td>?</td>
</tr>
<tr>
<td>AbuRahma(^4) (1991)</td>
<td>19</td>
<td>—</td>
<td>66</td>
<td>58</td>
<td>42</td>
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<tr>
<td>Coleman(^2) (2013)</td>
<td>17</td>
<td>3</td>
<td>101</td>
<td>82</td>
<td>56</td>
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<td>Shaydakov (2014) (unpublished data)</td>
<td>10</td>
<td>—</td>
<td>60</td>
<td>83</td>
<td>100</td>
</tr>
</tbody>
</table>

\(^a\) Modified from Coleman et al.\(^2\)

\(\text{AVF} = \text{arteriovenous fistula.}\)


