Outcomes of Peripheral Endovascular Interventions Based on Hospital Volume: A Mini Review of Published Literature

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Introduction
The incidence and prevalence of peripheral arterial disease (PAD) has been increasing and it accounts for major morbidity and mortality. Although surgical endarterectomy of arterial occlusive disease remains the gold standard for plaque removal, recent advances in percutaneous endovascular interventions have made this option more viable. Recently there has been advancements in the techniques which claim to provide superior results. Ever since the invention of coronary atherectomy device by John Simpson in 1984 [1], there has been innovations in the endovascular intervention at a tremendous pace. Soon, the technology was used in peripheral arteries for revascularization but the results were not satisfactory in the peripheral arterial circulation [2,3]. Numerous studies have been published citing the influence of hospital volume on the outcomes in the various structural heart diseases but not many studies have been out comparing that with PAD [4].

Methods
Hospital procedural volume is an important quality metric in regards to outcomes of procedure [4]. This is especially true in non-emergent, more complicated and less commonly performed procedures such as peripheral endovascular interventions [4,5]. The basis hypothesis that higher procedure volume is associated with better experience has formed the crux of the volume outcome relationships for about four decades now. We present an overview of the available literatures that underscores the importance of hospital volume in peripheral angioplasty, atherectomy and endovascular stenting.

Highlights
Previous literature showed hospital procedural volume is an independent predictor for outcomes of various cardiac procedures. However, very few studies shown similar results for peripheral endovascular interventions especially peripheral atherectomy. Here we are reviewing previously published articles to provide volume-outcome relationship for peripheral atherectomy and angioplasty with or without endovascular stenting. We found higher hospital volume significantly and independently lowers in-hospital mortality, amputation rates, peri-procedural complications, length and cost of hospitalization for peripheral endovascular interventions.

Keywords: Peripheral Vascular Disease; Endovascular Intervention; Review

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a total of 21,015 patients with mean age of 69.53 years, with 56% males and 61% Caucasians. Higher hospital volume tertile was associated with a significantly lower mortality (OR 0.42, 95% CI 0.30-0.57, p<0.0001), amputation rates (5.34% vs. 9.32%, p<0.0001), combined endpoint of mortality and complications (OR 0.53, 95% CI 0.49-0.58, p<0.0001), shorter LOS (4.86 vs. 6.79 days, p<0.0001) and lower hospitalization cost ($23,062 vs. $30,794, p<0.0001). Subgroup analysis for acute and chronic limb ischemia showed similar results [6, 7]. (Figure 1 & 2).

Peripheral Angioplasty and Endovascular Stenting

In a recently published study by Arora et al, they identified a total of 92,710 lower extremity endovascular angioplasty and stenting from NIS database of 2006 - 2011 with 54.8% male and 59.5% white patients. The study showed an increasing hospital volume quartile was independently predictive of lower composite endpoint of mortality and post-procedural complications (0.85, 0.73-0.97, 0.02 for the 4th quartile), along with lower in-hospital mortality (0.65, 0.52-0.82, p<0.001 for the 4th quartile). Furthermore, higher hospital volume significantly lower amputation rates (0.52, 0.45-0.61, p<0.001), and lower hospitalization costs ($-3889, 95% CI -5318 - -2459, p<0.001) [8].

Discussion

The ACC/ACP/SCAI/SVMB/SVS Clinical Competence Statement on Vascular Medicine and Catheter-Based Peripheral Vascular Interventions has set a threshold of at least 25 cases annually for a provider to maintain competence, but there is no such recommendation for hospital volume in the current guidelines [9].

A previous study showed that hospital volume was found to be a significant predictor of outcomes in endovascular interventions for aorto-iliac occlusive disease and that the LOS was lower for high volume hospitals when compared to lower volume hospitals. However, there was no difference in mortality among different hospital volumes, which could be attributed to an overall low mortality rate [10]. Another study showed that a high volume provider, regardless of the specialty used fewer hospital resources in infra-iliac percutaneous transluminal angioplasty [11].

Isogai T et al., in their study involving 10,000 patients reported that higher hospital volume was significantly associated with lower complication rates of rotational atherectomy [12]. Our analysis from a larger inpatient database proved that all the outcomes were significantly better if a patient with PAD underwent endovascular interventions at a high volume center.

The limitations of our study were the non-quantifiable variables like experience and skill of the interventionist. However, as it has been proven in the other studies that higher procedure volume still has a significant impact on the in-hospital mortality and other adverse outcome. Therefore, for better patient outcomes, consideration should be given for referring patient with PAD requiring PPA to a higher volume center.

Conclusion

The current review article presents a detailed overview of studies that demonstrate the importance of hospital procedural volume in predicting outcomes of peripheral atherectomy with or without angioplasty and stenting. However, further studies would be warranted to set actual volume thresholds for various other peripheral endovascular procedures.

Declarations of Interest

The authors declare no conflicts of interest.

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The authors state that they abide by the “Requirements for Ethical Publishing in Biomedical Journals” [13].

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