Patency Rates Among Heparin-Bonded and Conventional Polytetrafluoroethylene Grafts for Upper Extremity Hemodialysis Access

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Abstract

Background: *Although arteriovenous fistulae are the gold standard for vascular access, many patients do not have veins that are suitable for arteriovenous fistulae. These patients require arteriovenous grafts (AVGs). There have been no long-term trials designed to analyze the complication and patency rates of heparin-bonded versus conventional upper extremity AVGs. We aimed to compare patency and complication rates of upper extremity conventional versus heparin-bonded AVGs.*

Methods: *A retrospective chart review from 2008 through 2012 was conducted. Institutional review board approval was obtained. Patients with an upper extremity conventional or heparin-bonded AVG were included. Exclusion criteria included use of therapeutic anticoagulation and forearm loop grafts. Complication rates, reinterventions, and primary and secondary patency rates were compared using logistic regression analysis.*

Results: *The cohort consisted of 93 patients. Conventional and heparin-bonded grafts were compared and there was no statistically significant difference between the median time to use (29 vs 32 days;* $P = .440$*) or primary patency* ($P = .673$*). The duration of time elapsed until intervention was a median of 69 days (mean* $\pm$ *standard error* $= 94.7 \pm 10.4$ *days). Demographic characteristics of patients did not differ between the graft types (61% women;* $P = 0.342$*). No statistically significant differences were seen between comorbidities in the 2 groups and body mass index did not differ* ($P = .986$).

Conclusions: *There is no improved primary patency, secondary patency, or difference in complication rates between patients who received conventional versus heparin-bonded AVGs.*

Keywords: *dialysis access, graft patency, hemodialysis access, heparin bonded graft, patency, PTFE graft*

Introduction

Hemodialysis access for patients with end stage renal disease is best achieved with arteriovenous fistulae (AVF) as recommended by the Kidney Disease Outcomes Quality Initiative guidelines.[1] However, when access using native veins cannot be achieved due to lack of suitable veins, a prosthetic arteriovenous graft (AVG) is placed.[2-4] According to the National Kidney and Urologic Diseases Information Clearinghouse, before January 1, 2010, more than 871,000 people were diagnosed with end-stage renal disease; of these patients, 398,861 were receiving dialysis treatment. The percentage of grafts placed during 1980 that remained patent and adequate for use to 1990 was 25.7%. Improvement was seen gradually, with the survival rate from 1999 to 2009 rising to 44.9%.[5] Propaten (WL Gore and Associates, Inc, Flagstaff,

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AZ), an expanded polytetrafluoroethylene (PTFE) graft with long-term heparin bonding with covalent linkage was approved by the Food and Drug Administration for use as a hemodialysis access channel in 2006. A 20% improvement in clot-free graft patency for heparin-bonded grafts at 1 year has been documented.[6] We aimed to assess the patency and complication rates of upper extremity AVG, comparing heparin-bonded grafts to conventional PTFE grafts placed in the upper extremity for hemodialysis access. Complications such as edema, infection, hematoma, steal, aneurysm, infiltration, heparin-induced thrombocytopenia, and thrombosis are all recognized complications. Thrombosis may be 1 factor that contributes to the loss of dialysis access. Risk factors known to contribute to loss of graft patency include age, smoking history, hypertension, hyperlipidemia, diabetes, and duration of time on hemodialysis.

Although efforts to improve patency with use of a heparin-bonded AVG have been implemented, there have been no long-term trials designed to analyze the complication and patency rates of heparin-bonded versus conventional upper extremity AVGs. We compared primary patency and complication rates of upper extremity conventional versus heparin-bonded AVGs.

Methods

A retrospective chart review was conducted from February 2008 through June 2012. After obtaining approval from our hospital internal review board, we retrospectively reviewed patient charts that mentioned use of an upper extremity conventional or heparin-bonded AVG. Exclusion criteria included use of postoperative therapeutic anticoagulation and forearm loop grafts. In our practice of 4 surgeons, 2 surgeons routinely use conventional grafts and 2 surgeons have made it their practice to use heparin-bonded grafts. The decision regarding type of graft used was at the discretion of the surgeon based on their regular practice pattern. The location for graft placement was based solely on patient anatomy. Patient factors evaluated included age; body-mass index (BMI); hyperlipidemia; hypertension; diabetes; smoking; and graft location, including axillary, basilic, brachial, and cephalic. Complication rates and reinterventions, including venous/arterial duplex, pulse volume recording, fistulagram, angioplasty, stent, thrombectomy, vas-cath insertion, ligation, and new graft placement, were also evaluated. Primary patency and functional patency rates were compared using logistic regression analysis. Primary patency was defined as time from access construction to time of first intervention; secondary patency was defined as duration of use until abandoned. Statistical analysis included Wilcoxon rank sum test, and χ^2 test of homogeneity.

Results

The study cohort consisted of patients who only had 1 graft placed (n = 71) and patients with multiple grafts placed within the stated review dates (n = 22) for a total of 93 grafts. Thirty-one patients had a conventional PTFE graft (Gor-Tex; WL Gore and Associates, Inc, Flagstaff, AZ) placed and 62 patients had heparin-bonded grafts placed. Of these patients, 69 (86.2%) had 1 graft, 9 (11.3%) had 2 grafts, and 2 (2.5%) had 3 grafts placed within 1 year of the initial graft placement. There were 14 patients who were excluded because the grafts were not used, or no initial access date was available. The median time to use overall for both groups combined was 29 days. The mean ± standard deviation time to use was 49.4 ± 7.3 days.

The 2 graft types were compared using the Wilcoxon rank sum test because the times to use were not normally distributed. This test found no statistically significant difference (P = .440) between the median time to use of the conventional graft (32 days; n = 25) and the heparin-bonded graft (29 days; n = 53). Of those patients requiring a reintervention following initial graft use (n = 68), the median time to reintervention was 69 days (mean ± standard deviation = 94.7 ± 10.4 days) (Figure 1). The 2 graft types again were compared using the Wilcoxon rank sum test. This test found no statistically significant difference (P = .448) between the median

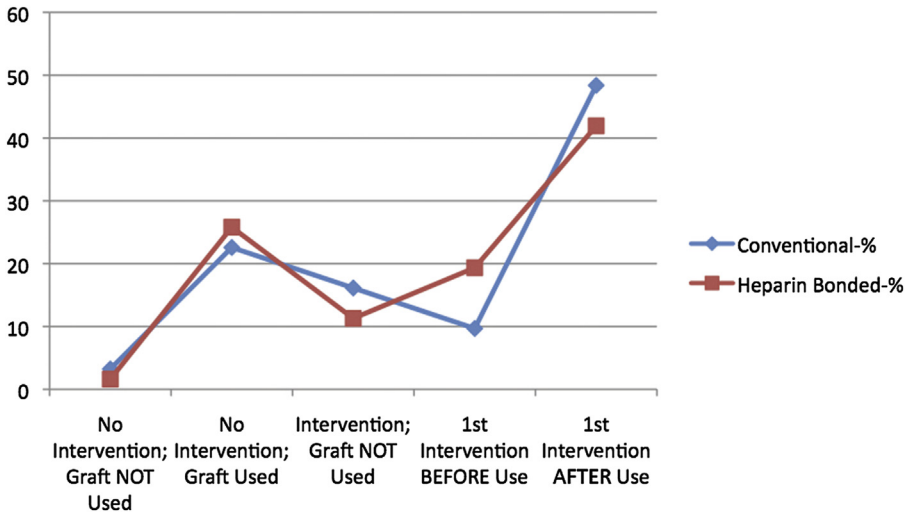

Figure 1. Comparison of primary patency distribution (P = .673).