Why is the mammary artery so special ?

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- The internal mammary arteries (IMAs) are commonly used as the conduit to bypass major coronary artery stenosis, and have shown greater long-term patency rates and improved survival as compared to saphenous vein grafts (SVGs)

Comparative anatomy of IMA and SVG

- In adults the diameter of the IMA varies from 1.9 to 2.6 mm, with a wall thickness of 180 to 430 microns
- The intima consists of endothelium with some neointima, which is seen in up to 50% of cases and rarely (13%) is there a substantial neointima which is greater than the medial thickness

- The media consists of discreet lamellae of collagen and smooth muscle cells (SMCs) that are located between the elastic layers and are aligned circumferentially.
- The number of elastic layers varies from 7 to 11, depending upon the thickness of the wall of the IMA. The adventitia has been shown to possess very few vasa vasorum

- On the other hand, the SVG has a larger diameter (3.1 to 8.5 mm) and its wall thickness ranges from 180 to 650 microns
- The vein has longitudinally oriented bundles of SMCs in the inner media and adventitia and the circumferentially oriented medial cells are in between the longitudinal fibers
- Type I collagen separates the longitudinally oriented SMC bundles and is also interspersed between the circumferentially oriented SMCs

- Elastic lamellae are observed in the intima, media and adventitia
- In the intima, there is no prominent internal elastic lamina; however, multilayered appearance is observed with interspersed SMC and collagen

Histologic changes observed in long-term IMA graft versus SVG

- It is well known that SVGs are susceptible to accelerated atherosclerosis as compared to native coronary arteries or IMAs, thus limiting the long term benefits of coronary artery bypass graft (CABG) surgery with SVGs
- SVGs at the time of implantation show focal absence of endothelium with platelet and fibrin deposition along the intimal surface.

- Acute inflammatory cells are often observed in the wall of the graft
- Vein grafts in place for more than one month show diffuse intimal thickening consisting of SMCs, proteoglycans and collagen
- SVGs implanted for over one year show arterialization and fibrointimal thickening that consists of SMCs, proteoglycans, and type I and III collagen.

- The changes of atherosclerosis in SVGs also correlate with the presence of risk factors as they do for native coronary arteries
- Early IMA graft failure is most commonly attributed to technical errors with harvesting and the graft anastomosis
- IMA grafts examined within the first week following distal anastomosis show an absence of neointimal thickening or there are only a few SMC along with proteoglycan and collagen

- When IMA grafts are examined between 1 week and 2 months, the site of the anastomosis shows intimal thickening (0.08±0.07 mm) located at the cleft between the native artery and the IMA graft at the anastomotic suture site
- The intimal thickening consisted of SMCs, proteoglycan, collagen and elastin fibers with luminal endothelial cells

- However, in the body of the graft at this time, there are only occasional areas that show minimal intimal thickening consisting of a few SMCs in a proteoglycan matrix with or without collagen

- Significant intimal thickening was observed in grafts implanted for 2 months to 10 years at the suture sites(0.39±0.17 mm) and on the hood (0.29±0.25 mm), while intimal thickening on the floor (native LAD) was observed in 10 of 18 IMA grafts (0.11±0.12 mm)

- The body of the IMA graft also showed the least intimal thickening as compared to the anastomotic site (10 of 18, 0.03±0.04 mm).

- Our published long-term morphologic data in IMA grafts versus SVGs was reported in 1988 , where 18 IMAs were compared to 15 SVGs from 18 patients with duration of grafts between 12 to 118 months (mean, 56 months) that had been removed either surgically or at necropsy. We found that fibrointimal proliferation alone was more frequent in IMAs as compared to SVGs [IMA; 8 of 18 (44%) versus SVG; 4 or 15 (27%)].

- However, since vein grafts beyond one year are often accompanied by foam cell infiltration, with or without a necrotic core, such changes were observed in 9 of 15 SVGs (60%). In contrast, atherosclerosis was extremely rare in IMA grafts and was only observed in 1 of 18 IMA (6%) and that too consisted of only a few foam cells within the neointimal tissue in a graft which showed severe stenosis at the anastomotic site at 3 years

- Not only has the left IMA graft to the LAD been demonstrated to remain patent and improve longevity at 10- and 15-years, bilateral IMA has an additional effect of reducing myocardial infarction, reoperation and percutaneous coronary interventions (PCI) .

- Similarly, skeletonization of the IMA had no effect on long-term patency, but added extra length
- Bilateral IMA are also increasingly being used as Y- or T-composite arterial grafts for treating 3-vessel coronary artery disease.

- this also carries the possibility of decreased risk of deep sternal infection