Review Article

INTERNATIONAL JOURNAL OF CURRENT MEDICAL AND PHARMACEUTICAL RESEARCH

ISSN: 2395-6429, Impact Factor: 4.656
Available Online at www.journalcmpr.com
Volume 4; Issue 5(A); May 2018; Page No. 3310-3311
DOI: http://dx.doi.org/10.24327/23956429.ijcmpr20180450

MOLECULAR TARGETING AND SURGERY: UNLIKELY BEDFELLOWS IN THE ERA OF VALUE-BASED MEDICINE

Grant Fankhauser*

Director of Quality Management, Department of Surgery University of Texas Medical Branch Galveston, Texas, USA

ARTICLE INFO

Article History:
Received 5th February, 2018
Received in revised form 24th March, 2018
Accepted 18th April, 2018
Published online 28th May, 2018

Key words:
value-based medicine, stroke, VCAM, carotid, vascular surgery

ABSTRACT

Value is a hot topic in most healthcare environments. Unfortunately, costs are frequently high in the areas of genetic testing/sequencing and molecular targeting. Surgery is another area of healthcare with traditionally high costs. There is an opportunity to help control costs while improving outcomes by bringing together molecular targeting and surgery. This is especially true in the field of vascular surgery. Molecular targeting may provide the answer as to which patients with carotid disease would benefit from surgical intervention and those to whom surgery would offer little benefit. Several promising targets include vascular cell adhesion molecule 1 (VCAM1), the class A macrophage scavenger receptor (MSR-A), matrix metalloproteinases (MMPs), and cathepsins. Other targets of interest include myeloperoxidase, fibrin, factor XIII, intercellular adhesion molecule 1, tissue factor, LOX-1, and von Willebrand factor. A VCAM1 targeting contrast medium suitable for use in humans may soon be developed. In all likelihood, a combination of molecular targets and imaging modalities may be used to stratify risk in patients with asymptomatic carotid disease. Surgery should not be overlooked as we advance our understanding of disease at the molecular or genetic level. Using molecular targeting to identify patients most likely to benefit from surgery will increase value in healthcare. The development of in vivo molecular targeting and imaging will require a substantial investment upfront, but the potential discoveries may alter the landscape of healthcare delivery for decades. While maximizing value is a laudable endeavor, we cannot sacrifice future innovation for short-term improvements in cost-efficiency.

INTRODUCTION

Value is a hot topic in most healthcare environments. When it comes to healthcare, value is generally defined as the sum of quality and outcome divided by cost. In the attempt to maximize the value equation we can increase quality, improve outcomes, or decrease cost. Unfortunately, costs are frequently high in the areas of genetic testing/sequencing and molecular targeting. Surgery is another area of healthcare with traditionally high costs. There is an opportunity to help control costs while improving outcomes by bringing together molecular targeting and surgery. This is especially true in the field of vascular surgery.

Stroke is the fourth leading cause of death in the United States and causes considerable morbidity in survivors. The long-term care for patients who have suffered strokes places a strain on any healthcare system as well as on the patients, their caretakers, and their families.[1] While preventing every stroke is not possible, many strokes are attributable to atherosclerotic disease of the aorta and carotid arteries. Patients with known vascular disease or risk factors are often screened for carotid stenosis. Patients with severe stenosis are often referred for carotid surgery (endarterectomy or stenting) to reduce the risk of stroke. The decision-making process for this relies upon studies conducted over the past two decades regarding the medical and surgical treatment of asymptomatic and symptomatic carotid disease.[2] For symptomatic carotid disease, there is ample evidence supporting surgery to significantly reduce the risk of future strokes.[3] For asymptomatic disease the data is less convincing. There are likely many patients undergoing carotid surgery whose risk of stroke is not significantly reduced post-operatively. Conversely, there are also likely many patients whose risk of stroke might be reduced by carotid surgery but do not have classic indications for surgery.

Molecular targeting may provide the answer as to which patients would benefit from surgical intervention and those to whom surgery would offer little benefit. The first step is choosing molecular targets and focusing on those that might be identified *in vivo*. Patients with atherosclerotic plaques demonstrating increased levels or activity of the target molecule could be referred for more aggressive treatment (medical or surgical) while those without could be spared surgery. Several promising targets have already been

Corresponding author:* **Grant Fankhauser
Director of Quality Management, Department of Surgery University of Texas Medical Branch Galveston, Texas, USA

identified and imaging techniques have been described. These include vascular cell adhesion molecule 1 (VCAM1), the class A macrophage scavenger receptor (MSR-A), matrix metalloproteinases (MMPs), and cathepsins.[4] Other targets of interest include myeloperoxidase, fibrin, factor XIII, intercellular adhesion molecule one, tissue factor, LOX-1, and von Willebrand factor.[5-8] A number of imaging modalities have been used in conjunction with novel targeted contrast agents to allow detection of target molecules *in vivo*.[9] Promising work is already underway to use contrast enhanced ultrasound with molecular imaging to identify high risk carotid plaques exhibiting VCAM1.[10] A VCAM1 targeting contrast medium suitable for use in humans may soon be developed. In all likelihood, a combination of molecular targets and imaging modalities may be used to stratify risk in patients with asymptomatic carotid disease.

DISCUSSION

Genetic testing and molecular targeting often precedes the development of targeted pharmaceuticals for medical treatment, but surgery should not be overlooked as we advance our understanding of disease at the molecular or genetic level. Medical therapy may reduce the need for surgical intervention but is unlikely to eliminate the need completely. Surgery can certainly be costly, but delaying appropriate surgical care may cost more, and unnecessary surgery should be an avoidable cost. Using molecular targeting to identify patients most likely to benefit from surgery will increase value in healthcare. The development of *in vivo* molecular targeting and imaging will require a substantial investment upfront, but the potential discoveries may alter the landscape of healthcare delivery for decades. While maximizing value is a laudable endeavor, we cannot sacrifice future innovation for short-term improvements in cost-efficiency. The value equation must be evaluated in the context of an appropriately distant outlook to prevent stifling innovation.

CONCLUSION

In the era of value-based healthcare, novel approaches to diagnosis and treatment must be considered. Collaboration between seemingly disparate fields should be entertained to produce the highest quality outcomes most efficiently.

References

1. Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, *et al*. Global and regional burden of stroke during 1990-2010: findings from the Global Burden of Disease Study 2010. *Lancet*. 2014;383(9913):245-54.
2. Endarterectomy for asymptomatic carotid artery stenosis. Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. *JAMA*. 1995;273(18):1421-8.
3. North American Symptomatic Carotid Endarterectomy Trial C, Barnett HJM, Taylor DW, Haynes RB, Sackett DL, Peerless SJ, *et al*. Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. *New England Journal of Medicine*. 1991;325(7):445-53.
4. Shaw SY. Molecular imaging in cardiovascular disease: targets and opportunities. *Nature Reviews Cardiology*. 2009;6(9):569-79.
5. Liu Y, Davidson BP, Yue Q, Belcik T, Xie A, Inaba Y, *et al*. Molecular imaging of inflammation and platelet adhesion in advanced atherosclerosis effects of antioxidant therapy with NADPH oxidase inhibition. *Circulation Cardiovascular imaging*. 2013;6(1):74-82.
6. Lindner JR. Molecular imaging of vascular phenotype in cardiovascular disease: new diagnostic opportunities on the horizon. *Journal of the American Society of Echocardiography*. 2010;23(4):343-50; quiz 450-2.
7. Shim CY, Liu YN, Atkinson T, Xie A, Foster T, Davidson BP, *et al*. Molecular Imaging of Platelet-Endothelial Interactions and Endothelial von Willebrand Factor in Early and Mid-Stage Atherosclerosis. *Circulation Cardiovascular imaging*. 2015;8(7):e002765.
8. Li D, Patel AR, Klibanov AL, Kramer CM, Ruiz M, Kang B-Y, *et al*. Molecular imaging of atherosclerotic plaques targeted to oxidized LDL receptor LOX-1 by SPECT/CT and magnetic resonance. *Circulation Cardiovascular imaging*. 2010;3(4):464-72.
9. Lindner JR, Sinusas A. Molecular imaging in cardiovascular disease: Which methods, which diseases? *Journal of Nuclear Cardiology*. 2013; 20(6):990-1001.
10. Weinkauf CC, Concha-Moore K, Lindner JR, Marinelli ER, Hadinger KP, Bhattacharjee S, *et al*. Endothelial vascular cell adhesion molecule 1 is a marker for high-risk carotid plaques and target for ultrasound molecular imaging. *Journal of Vascular Surgery*. 2018;13:13.

How to cite this article:

Grant Fankhauser *et al* (2018) 'Molecular targeting and surgery: unlikely bedfellows in the era of value-based medicine', *International Journal of Current Medical And Pharmaceutical Research,* 04(5), pp. 3310-3311.

****