

Myocardial Infarction Causing Remodeling of Crdiomyoctyes

ANUM AKRAM¹, SAMIA SADIQ², MADIHA MEHMOOD³, UMAIR ASGHAR⁴

ABSARCT

Aim: To observe immediate changes in cardiomyocytes repair after myocardial infarction and it's possible treatment in tertiary care hospitals of Lahore.

Methods:In this observational study 1250 patients (mean 48±5 years, 58% males) with myocardial infarction after 4 weeks. Infracted marks in the myocardium cell enhances receptor signaling, while commencement of releasing oxygen provoke cytokine and chemokine. High population of invading leucocytes remove the infarct from dead cell area, on the other hand give boost to cells that escort to making a scar. As soon as infarct heals then ventricle starts to remodels, shape, cardiac cell alteration links with remodeling of post infarction cardiac cells aggravating by layer of inflammatory cells.

Results:Treatment of exact inflammatory agents through medication may not reducing the quantity of cardiomyocytes in the infracted area, but can shield the heart chamber from tissue dilatation and remodeling, which may leads to heart failure after myocardial infarction. The malfaunction of medication in patients with myocardial infarction may lead to surgical intervention.

Conclusion: Treatment in response to inflammatory reponse to ease unconditional remodeling of cardiomyocytes in patients with myocardial infarction in quiet helpful and having good prognosis. Patients, which shows aggressive remodeling may achieve formation of new cardiac muscles.

Keywords: Myocardial infarction, Remodeling, Cardiac muscle.

INTRODUCTION

In the recent development in pharmacology and quick treatment have considerably decrease the mortality in myocardial infarction patients. Cardiac remodeling is rely on response of immune system that respond to shades of the scar on wound from dead cells and to fabricate different mediators that boost the fibroblast growth and formation of new angiogenesis¹. Nevertheless, start of immune mediators to remodeling the cardiac muscles may not give valuable results alone². Even in growing age, the slow materialization of myocardial infarction in presence of good body health may not respond any excellent pressures directly on immune system³.

In last 20 years a lot of research work give evidences regarding the immune reaction, which may give lengthening time to remodeling and recovery due to delay in treatment of myocardial infarction⁴. It is due quick loss of huge quantity of cardiomyocytes after myocardial infarction is due to extreme inflammatory reaction, many evidences on immune system commencement after cardiac injury is derivative from research work in ischemic heart disease⁵. However, in 1987s and 1994s widespread research evidence recommended that most of the inflammatory cells penetrate the targeted myocardium, can aggravate the ischemic injury leading towards death of extremely important cardiomyocytes⁶.

Email: dr_anumakram14@yahoo.com Cell: 0336-3321332

The pathogenesis in the infarcted heart, there is huge amount cardiomyocytes during sudden necrosis give many intracellular contents and initiates inflammatory process⁷. Several divergent, pathways speedup the role of inflammation after myocardial infarction⁸. In the start, harmonize flow of subcellular constituents via membrane activates⁹. Many of the experimental evidences show continuously destruction of cardiomyocytes enhances the inflammatory response clicks the strict role of subcellular constituents in ischemic myocardium¹⁰. Later, damage cell area and matrix surrounding extracellular free liberate endogenous signals referred to as damage links molecular patterns (DAMPs)^{11,12}. Many hyaluronan parts, ATP, Shock protein and mitochondria may show as harmful signals in the damaged myocardium simultaneously releasing inflammatory response. DAMPs push all pro-inflammatory steps by stimulating particles of receptor family¹³.

PATIENTS & METHODS

In this observational study 1250 patients (mean 48±5 years, 58% males) with myocardial infarction after 4 weeks. Infarcted marks in the myocardium cell enhances receptor signaling, while commencement of releasing oxygen provoke cytokine and chemokine. High population of invading leucocytes remove the infarct from dead cell area, on the other hand give boost to cells that escort to making a scar. As soon as infarct heals then ventricle starts to

¹WMO, THQ, Murree,

²WMO, PIC, Lahore

³MO, Mayo Hospital, Lahore,

⁴PGR, PIC, Lahore

Correspondence to Dr. AnumAkram

remodels, shape, cardiac cell alteration links with remodeling of post infarction cardiac cells aggravating by layer of inflammatory cells and sometimes may lead to heart failure. All types of tissues and cell take part in remodeling of cardiac muscles and resolution of inflammatory reaction after myocardial infarction can be controlled well by advanced pharmacological agents. Because of unique cytokine and growth factor, which regulated their involvement in mononuclear cell subpopulations are suitable to act as main regulator of all the inflammatory reactions. Our study describe that T cells showing different receptors play role to boost the inflammatory response triggering remodeling of infarcted cells.

RESULTS

Many neutrophils can hold the inflammation through their death after myocardial infarction. Apoptotic neutrophils cleared by triggering huge amount of macrophages release of inflammatory mediators. Infarct area vascularize by pericyte coat of endothelial inflammatory activity. Treatment of exact inflammatory agents through medication may not reducing the quantity of cardiomyocytes in the infarcted area, but can shield the heart chamber from tissue dilatation and remodeling, which may leads to heart failure after myocardial infarction. The malfunction of medication in patients with myocardial infarction may lead to surgical intervention. Quick inflammation enhances the remodeling of the infarcted heart through the activation of proteinases reaction, engulfing matrix loss and loose the tensile muscle force of the infarct.

All the consequence of changes explain in variables of study are mainly depends upon the aging and cardiopulmonary weakness of patients. It is exhibit by results that all the inflammatory activity after myocardial infarction has good response of remodeling cardiac cell repair.

DISCUSSION

In this observational study 1250 patients (mean 48±5 years, 58% males) with myocardial infarction after 4 weeks. Infarcted marks in the myocardium cell enhances receptor signaling, while commencement of releasing oxygen provoke cytokine and chemokine. In the start use of anti-inflammatory treatment is quiet beneficial to limit ischemic injury. Bearing in mind the important role of inflammatory response in myocardial infarction and cardiac repair, there direct role of inflammatory mediators in cardiac repair gets good results as well as new findings through exemplar shift in realistic approach¹⁴.

In a cross-sectional study Bujak M et al, describe that targeting inflammatory mediators

cannot save a mark amount of cardiomyocytes in deoxygenated infarcts, but inflammation may defend the cardiac chamber loosening and adverse dilatation, the severe irreversible condition of heart failure after myocardial infarction. After loosening sign of heart chamber dilation may affect the cardiac output for vigorous activity¹⁵.

Carrabba N et al shows results about the pathophysiologic complications of remodeling after myocardial infarction. They describe that sudden after acute infarction, patients shows many different type of responses varies according to the age, gender, hypertension and treatment dependent on the size of infarction¹⁶. Few patients shows significant dilation and quick progress to heart failure as well as some patients develop progressive fibrosis leads to diastolic dysfunction¹⁷. They concluded that age, gender, genetic disposition and morbid conditions (like diabetes or hypertension) might influence the remodeling of infarcted area. So these patients may focused to anti-inflammatory plans to protect from expansion of adverse remodeling¹⁸.

In an observational study, Schwab IM et al describe the self-limited inflammation in myocardial infarction. According to them the quantitative initial assessment of different track neutrophils and cytokine releases after myocardial infarction play key role in remodeling of ischemic area. The time of inflammatory factors reaction and exudates have significant results¹⁹. The use of these parameters describing the resolving and the affected area during resolution phase²⁰. In addition, use of different therapeutic agents develop to increase the inflammation and reducing the cardinal signs, which can decrease the time of recovery²¹.

Navarro et al gives conclusion, regarding their observational study that all the discussion regarding the acute inflammation is sensitive process in maintaining organ homeostasis²². So, there is no any wonder if there is any biological process going to overcome the inflammatory process²³. There is also process of some unique type of receptors recognized that are found on inflammatory cells that play role in sensitivity and specificity of resolving system²⁴. They performed experimental process regarding inflammation and remodeling the ischemic cardiomyocytes, it has been established that resolving lipid receptors²⁵.

CONCLUSION

In the last the elementary role of quick inflammatory helps to maintain the poor oxygenation of ischemic cardiomyocytes and helps to provide normal homeostasis to the cardiomyocytes. Treatment in response to inflammatory reponse to ease unconditional remodeling of cardiomyocytes in

patients with myocardial infarction in quiet helpful and having good prognosis.

REFERENCE

1. Frangogiannis NG. Regulation of the inflammatory response in cardiac repair. *Circulation research*. 2012 Jan 06;110(1):159-73. PubMed PMID: 22223212. Pubmed Central PMCID: PMC3690135. Epub 2012/01/10. eng.
2. Frantz S, Bauersachs J, Ertl G. Post-infarct remodelling: contribution of wound healing and inflammation. *Cardiovascular research*. 2009 Feb 15;81(3):474-81. PubMed PMID: 18977766. Pubmed Central PMCID: PMC2639128. Epub 2008/11/04. eng.
3. Armstrong PW, Granger CB, Adams PX, Hamm C, Holmes D, Jr., O'Neill WW, et al. Pexelizumab for acute ST-elevation myocardial infarction in patients undergoing primary percutaneous coronary intervention: a randomized controlled trial. *Jama*. 2007 Jan 03;297(1):43-51. PubMed PMID: 17200474. Epub 2007/01/04. eng.
4. Timmers L, Pasterkamp G, de Hoog VC, Arslan F, Appelman Y, de Kleijn DP. The innate immune response in reperfused myocardium. *Cardiovascular research*. 2012 May 01;94(2):276-83. PubMed PMID: 22266751. Epub 2012/01/24. eng.
5. Arslan F, de Kleijn DP, Pasterkamp G. Innate immune signaling in cardiac ischemia. *Nature reviews Cardiology*. 2011 May;8(5):292-300. PubMed PMID: 21448140. Epub 2011/03/31. eng.
6. Entman ML, Michael L, Rossen RD, Dreyer WJ, Anderson DC, Taylor AA, et al. Inflammation in the course of early myocardial ischemia. *FASEB journal : official publication of the Federation of American Societies for Experimental Biology*. 1991 Aug;5(11):2529-37. PubMed PMID: 1868978. Epub 1991/08/01. eng.
7. Andrassy M, Volz HC, Igwe JC, Funke B, Eichberger SN, Kaya Z, et al. High-mobility group box-1 in ischemia-reperfusion injury of the heart. *Circulation*. 2008 Jun 24;117(25):3216-26. PubMed PMID: 18574060. Epub 2008/06/25. eng.
8. Dobaczewski M, Gonzalez-Quesada C, Frangogiannis NG. The extracellular matrix as a modulator of the inflammatory and reparative response following myocardial infarction. *Journal of molecular and cellular cardiology*. 2010 Mar;48(3):504-11. PubMed PMID: 19631653. Pubmed Central PMCID: PMC2824059. Epub 2009/07/28. eng.
9. Timmers L, Sluijter JP, van Keulen JK, Hoefler IE, Nederhoff MG, Goumans MJ, et al. Toll-like receptor 4 mediates maladaptive left ventricular remodeling and impairs cardiac function after myocardial infarction. *Circulation research*. 2008 Feb 01;102(2):257-64. PubMed PMID: 18007026. Epub 2007/11/17. eng.
10. Arslan F, Smeets MB, O'Neill LA, Keogh B, McGuirk P, Timmers L, et al. Myocardial ischemia/reperfusion injury is mediated by leukocytic toll-like receptor-2 and reduced by systemic administration of a novel anti-toll-like receptor-2 antibody. *Circulation*. 2010 Jan 05;121(1):80-90. PubMed PMID: 20026776. Epub 2009/12/23. eng.
11. Nian M, Lee P, Khaper N, Liu P. Inflammatory cytokines and postmyocardial infarction remodeling. *Circulation research*. 2004 Jun 25;94(12):1543-53. PubMed PMID: 15217919. Epub 2004/06/26. eng.
12. Lastrucci C, Baillif V, Behar A, Al Saati T, Dubourdeau M, Maridonneau-Parini I, et al. Molecular and cellular profiles of the resolution phase in a damage-associated molecular pattern (DAMP)-mediated peritonitis model and revelation of leukocyte persistence in peritoneal tissues. *FASEB journal : official publication of the Federation of American Societies for Experimental Biology*. 2015 May;29(5):1914-29. PubMed PMID: 25609430. Epub 2015/01/23. eng.
13. Schroder K, Tschopp J. The inflammasomes. *Cell*. 2010 Mar 19;140(6):821-32. PubMed PMID: 20303873. Epub 2010/03/23. eng.
14. Mezzaroma E, Toldo S, Farkas D, Seropian IM, Van Tassel BW, Salloum FN, et al. The inflammasome promotes adverse cardiac remodeling following acute myocardial infarction in the mouse. *Proceedings of the National Academy of Sciences of the United States of America*. 2011 Dec 06;108(49):19725-30. PubMed PMID: 22106299. Pubmed Central PMCID: PMC3241791. Epub 2011/11/23.
15. Bujak M, Dobaczewski M, Chatila K, Mendoza LH, Li N, Reddy A, et al. Interleukin-1 receptor type I signaling critically regulates infarct healing and cardiac remodeling. *The American journal of pathology*. 2008 Jul;173(1):57-67. PubMed PMID: 18535174. Pubmed Central PMCID: PMC2438285. Epub 2008/06/07. eng.
16. Bolognese L, Carrabba N, Parodi G, Santoro GM, Buonamici P, Cerisano G, et al. Impact of microvascular dysfunction on left ventricular remodeling and long-term clinical outcome after primary coronary angioplasty for acute myocardial infarction. *Circulation*. 2004 Mar 09;109(9):1121-6. PubMed PMID: 14967718. Epub 2004/02/18. eng.
17. van der Laan AM, Piek JJ, van Royen N. Targeting angiogenesis to restore the microcirculation after reperfused MI. *Nature reviews Cardiology*. 2009 Aug;6(8):515-23. PubMed PMID: 19528962. Epub 2009/06/17. eng.
18. Fernandes MR, Fish RD, Canales J, Aliota J, Silva GV et al. Restoration of microcirculatory patency after myocardial infarction: results of current coronary interventional strategies and techniques. *Texas Heart Institute journal*. 2012;39(3):342-50. PubMed PMID: 22719142. Pubmed Central PMCID: PMC3368452. Epub 2012/06/22..
19. Schwab JM, Chiang N, Arita M, Serhan CN. Resolvin E1 and protectin D1 activate inflammation-resolution programmes. *Nature*. 2007 Jun 14;447(7146):869-74. PubMed PMID: 17568749. Pubmed Central PMCID: PMC2757086. Epub 2007/06/15. eng.
20. Li Y, Dalli J, Chiang N, Baron RM, Quintana C, Serhan CN. Plasticity of leukocytic exudates in resolving acute inflammation is regulated by MicroRNA and proresolving mediators. *Immunity*. 2013 Nov 14;39(5):885-98. PubMed PMID: 24238341. Pubmed Central PMCID: PMC3888517. Epub 2013/11/19. eng.
21. Mirakaj V, Dalli J, Granja T, Rosenberger P, Serhan CN. Vagus nerve controls resolution and pro-resolving mediators of inflammation. *The Journal of experimental medicine*. 2014 Jun 02;211(6):1037-48. PubMed PMID: 24863066. Pubmed Central PMCID: PMC4042652. Epub 2014/05/28. eng.
22. Navarro-Xavier RA, Newson J, Silveira VL, Farrow SN, Gilroy DW, Bystrom J. A new strategy for the identification of novel molecules with targeted proresolution of inflammation properties. *Journal of immunology (Baltimore, Md : 1950)*. 2010 Feb 01;184(3):1516-25. PubMed PMID: 20032295. Epub 2009/12/25. eng.
23. Recchiuti A, Codagnone M, Pierdomenico AM, Rossi C, Mari VC, Cianci E, et al. Immunoresolving actions of oral resolvin D1 include selective regulation of the transcription machinery in resolution-phase mouse macrophages. *FASEB journal : official publication of the Federation of American Societies for Experimental Biology*. 2014 Jul;28(7):3090-102. PubMed PMID: 24692596. Epub 2014/04/03. eng.
24. Orr SK, Colas RA, Dalli J, Chiang N, Serhan CN. Proresolving actions of a new resolvin D1 analog mimetic qualifies as an immunoresolvent. *American journal of physiology Lung cellular and molecular physiology*. 2015 May 01;308(9):L904-11. PubMed PMID: 25770181. Pubmed Central PMCID: PMC4421783. Epub 2015/03/15. eng.
25. Serhan CN. Resolution phase of inflammation: novel endogenous anti-inflammatory and proresolving lipid mediators and pathways. *Annual review of immunology*.

2007;25:101-37. PubMed PMID: 17090225. Epub
2006/11/09. Eng.