US009005672B2

(12) **United States Patent**
Michal et al.

(10) **Patent No.: US 9,005,672 B2**
(45) **Date of Patent: Apr. 14, 2015**

(54) **METHODS OF MODIFYING MYOCARDIAL INFARCTION EXPANSION**

(75) Inventors: **Eugene T. Michal**, San Francisco, CA (US); **Shubhayu Basu**, Mountain View, CA (US); **Alexander J. Sheehy**, Menlo Park, CA (US); **Francis G. Spinale**, Charleston, SC (US); **Rupak Mukherjee**, Charleston, SC (US)

(73) Assignees: **Abbott Cardiovascular Systems Inc.**, Santa Clara, CA (US); **Medical University of South Carolina**, Charleston, SC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 269 days.

(21) Appl. No.: **12/016,180**

(22) Filed: **Jan. 17, 2008**

(65) **Prior Publication Data**

US 2009/0022817 A1 Jan. 22, 2009
US 2015/0017265 A9 Jan. 15, 2015

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/561,328, filed on Nov. 17, 2006, now Pat. No. 8,741,326.

(60) Provisional application No. 60/885,593, filed on Jan. 18, 2007.

(51) **Int. Cl.**

A61K 33/06	(2006.01)
A61L 27/52	(2006.01)
A61L 27/20	(2006.01)
A61L 27/22	(2006.01)
A61L 27/26	(2006.01)
A61L 27/50	(2006.01)

(52) **U.S. Cl.**
CPC ***A61L 27/52*** (2013.01); ***A61L 27/20*** (2013.01); ***A61L 27/22*** (2013.01); ***A61L 27/26*** (2013.01); ***A61L 27/50*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,512,569	A	6/1950	Saffir
3,144,868	A	8/1964	Jascalevich
3,584,624	A	6/1971	de Ciutiis
3,780,733	A	12/1973	Martinez-Manzor
3,804,097	A	4/1974	Rudie
3,890,976	A	6/1975	Bazell et al.
4,141,973	A	2/1979	Balazs
4,617,186	A	10/1986	Schafer et al.
4,794,931	A	1/1989	Yock
4,818,291	A	4/1989	Iwatsuki et al.
4,842,590	A	6/1989	Tanabe et al.
5,000,185	A	3/1991	Yock
5,024,234	A	6/1991	Leary et al.
5,026,350	A	6/1991	Tanaka et al.
5,049,130	A	9/1991	Powell
5,092,848	A	3/1992	DeCiutiis
5,100,185	A	3/1992	Menke et al.
5,109,859	A	5/1992	Jenkins
5,116,317	A	5/1992	Carson et al.
5,128,326	A	7/1992	Balazs et al.
5,171,217	A	12/1992	March et al.
5,202,745	A	4/1993	Sorin et al.
5,203,338	A	4/1993	Jang
5,242,427	A	9/1993	Bilweis
5,270,300	A	12/1993	Hunziker
5,291,267	A	3/1994	Sorin et al.
5,306,250	A	4/1994	March et al.
5,321,501	A	6/1994	Swanson et al.
5,328,955	A	7/1994	Rhee et al.
5,336,252	A	8/1994	Cohen
5,354,279	A	10/1994	Hofling
5,365,325	A	11/1994	Kumasaka et al.
5,372,138	A	12/1994	Crowley et al.
5,380,292	A	1/1995	Wilson
5,419,777	A	5/1995	Hofling et al.
5,437,632	A	8/1995	Engelson
5,455,039	A	10/1995	Edelman et al.
5,459,570	A	10/1995	Swanson et al.
5,464,395	A	11/1995	Faxon et al.
5,465,147	A	11/1995	Swanson
5,485,486	A	1/1996	Gilhousen et al.
5,499,630	A	3/1996	Hiki et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP	0331584	9/1989
EP	0835667	4/1998

(Continued)

OTHER PUBLICATIONS

Eduardo et al. (Cardiovascular Research, vol. 75, pp. 178-185, Apr. 2007).*

(Continued)

Primary Examiner — Hope Robinson

(74) *Attorney, Agent, or Firm* — Randy Shen; Blakely Sokoloff Taylor & Zafman LLP

(57) **ABSTRACT**

A bioscaffolding can be formed within a post-myocardial infarct region sufficient to cause attenuation of a rate of myocardial infarct expansion. A bioscaffolding may further be formed in the post-myocardial infarct region to cause an increase in posterior left ventricular wall thickness. The gel or bioscaffolding can be formed from a mixture of gel components of different gelation systems. For example, a bioscaffolding can be formed by mixing at least two different components of at least two different two-component gelation systems to form a first mixture and by mixing at least two different components (other than the components that make up the first mixture) of the at least two different two-component gelation systems to form a second mixture.

15 Claims, 24 Drawing Sheets