CHẨN ĐOÁN ĐIỀU TRỊ
BỆNH LÝ CẦU CƠ ĐỘNG MẠCH VÀNH
MYOCARDIAL BRIDGING

TS.BS. HOÀNG PHƯƠNG
BỆNH VIỆN C ĐÀ NẴNG

MỤC TIÊU

Hiểu rõ các phương pháp chẩn đoán, hướng điều trị bệnh lý cầu cơ động mạch vành :

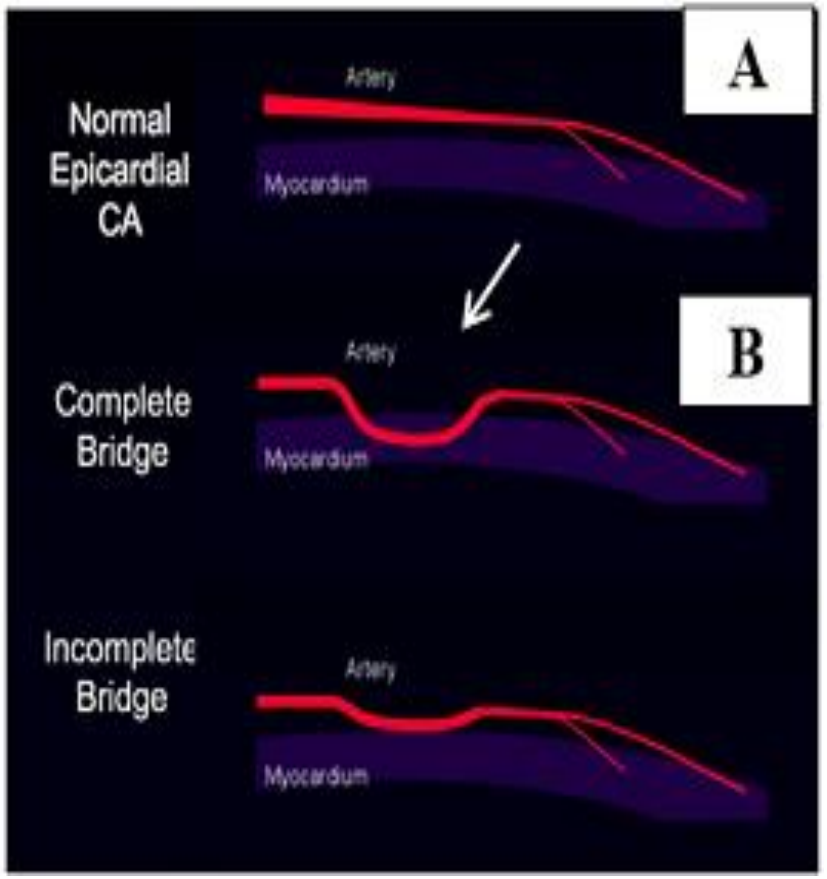
- ✓ *Chụp mạch vành chẩn đoán cầu cơ mạch vành có phải là tiêu chuẩn vàng ?*
- ✓ *Bệnh cầu cơ mạch vành có đặt Stent được không ?*

Nội dung

- ✓ *Định nghĩa, Bệnh học*
- ✓ *Dịch tể*
- ✓ *Triệu chứng*
- ✓ *Chẩn đoán*
- ✓ *Điều trị*
- ✓ *Kết luận*

ĐỊNH NGHĨA

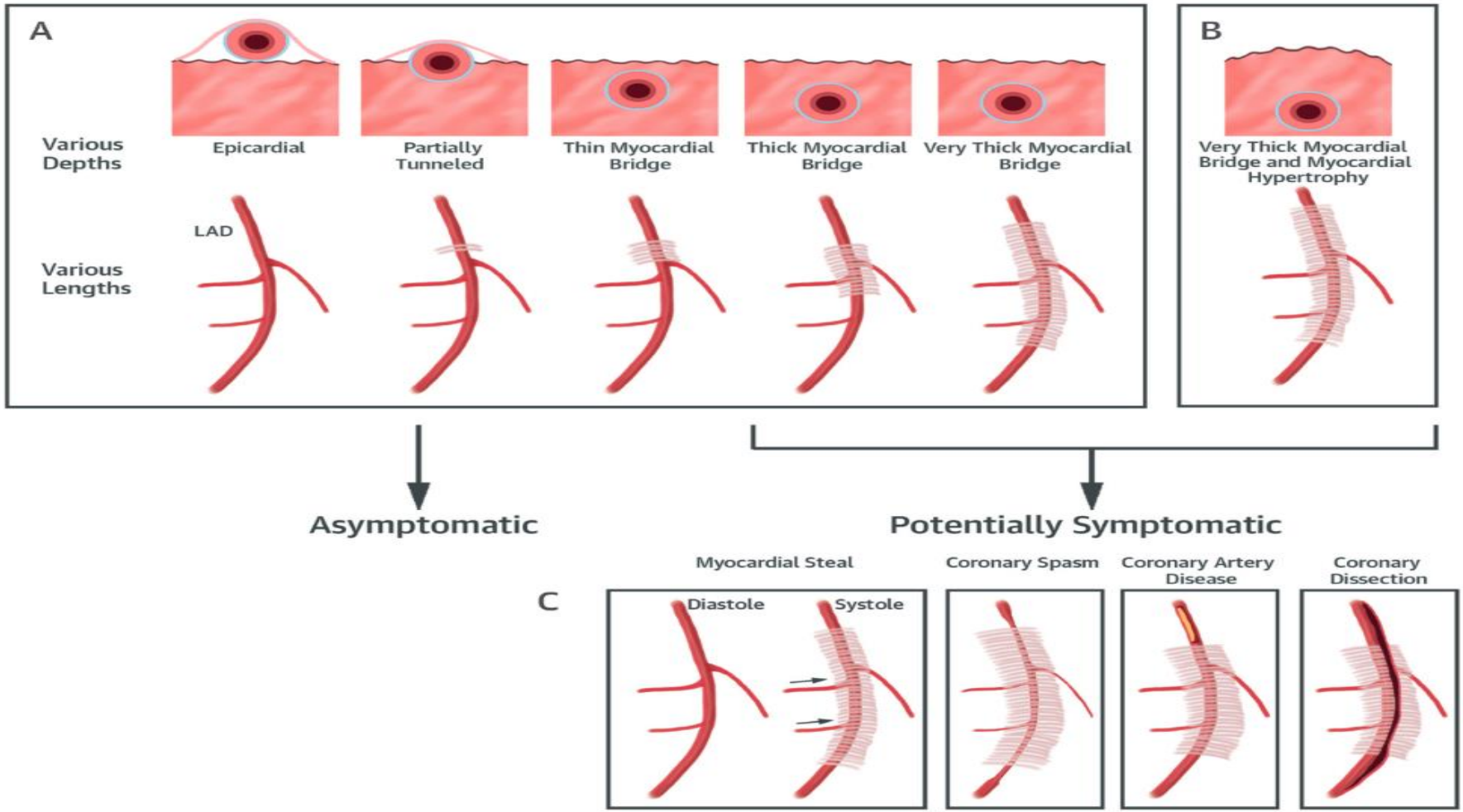
Thông thường các đoạn ĐMV đều chạy trên lớp thượng tâm mạc của tim song cũng có khi luồn sâu vào trong cơ tim một đoạn dài ngắn khác nhau trước khi xuất hiện trở lại trên bề mặt quả tim. Hiện tượng một đoạn ĐMV chạy giữa các lớp cơ tim ấy gọi là cầu cơ động mạch vành.



European Journal of Radiology, Volume 61, Issue 1, 130-138 Am Heart J, 1951, 41:359-368.
Circ J. 2010 Mar; 74(3):538-43.

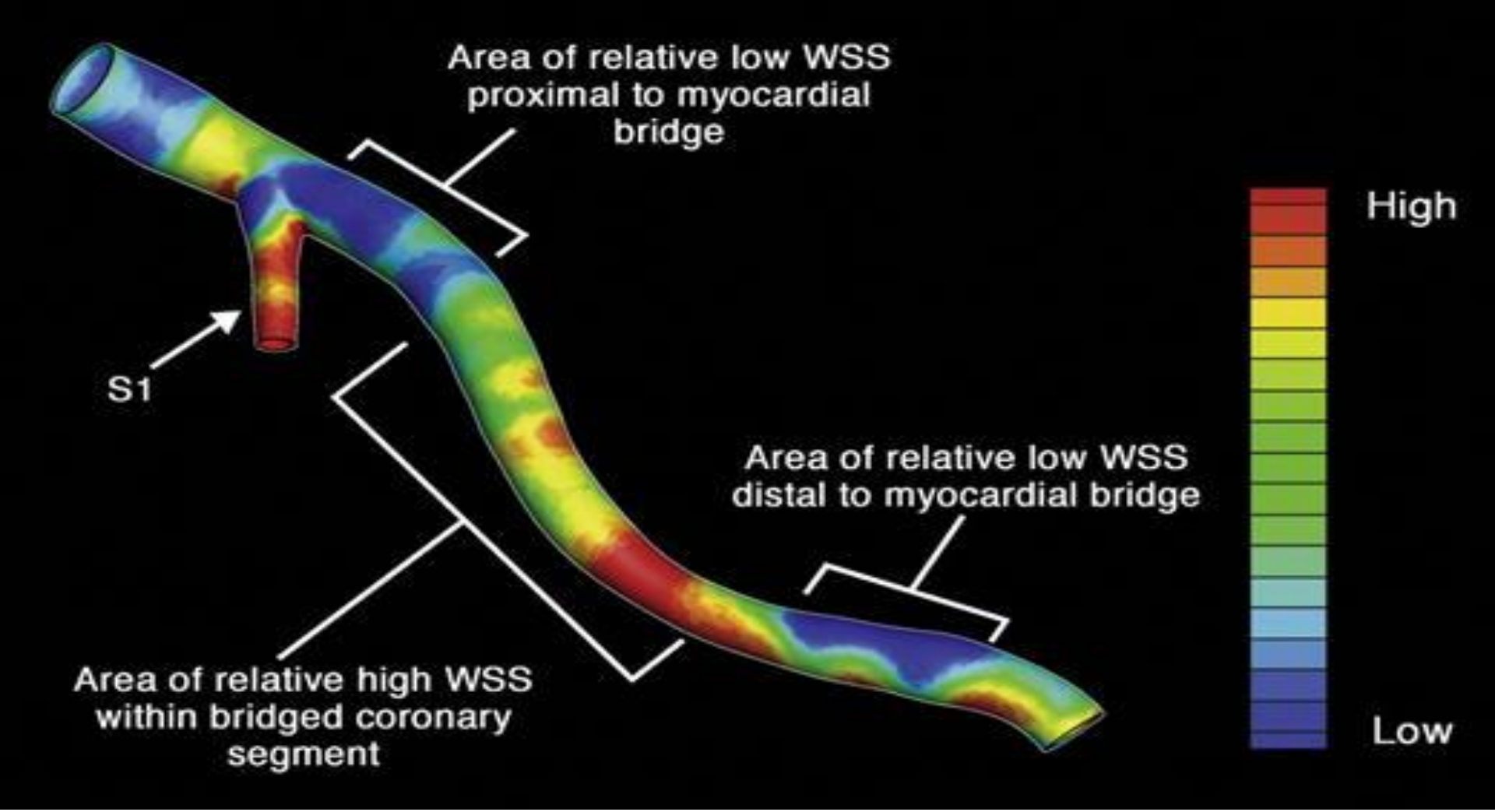
BỆNH HỌC

CENTRAL ILLUSTRATION **LAD Coronary Artery Myocardial Bridging: Anatomic Properties and Clinical and Pathophysiological Factors of MB of the LAD**



Tarantini, G. et al. J Am Coll Cardiol. 2016;68(25):2887–99.

(A) Morphological variations in tunneling (length and depth of tunneled segment). **(B)** Pathophysiological factors that may unmask or exacerbate myocardial bridging (MB). **(C)** Pathophysiological mechanisms that play a potential role in the genesis of the clinical factors related to MB, including "intramural steal" or "branch steal" mechanism, coronary spasm, coronary artery disease, and coronary dissection. LAD = left anterior descending artery.

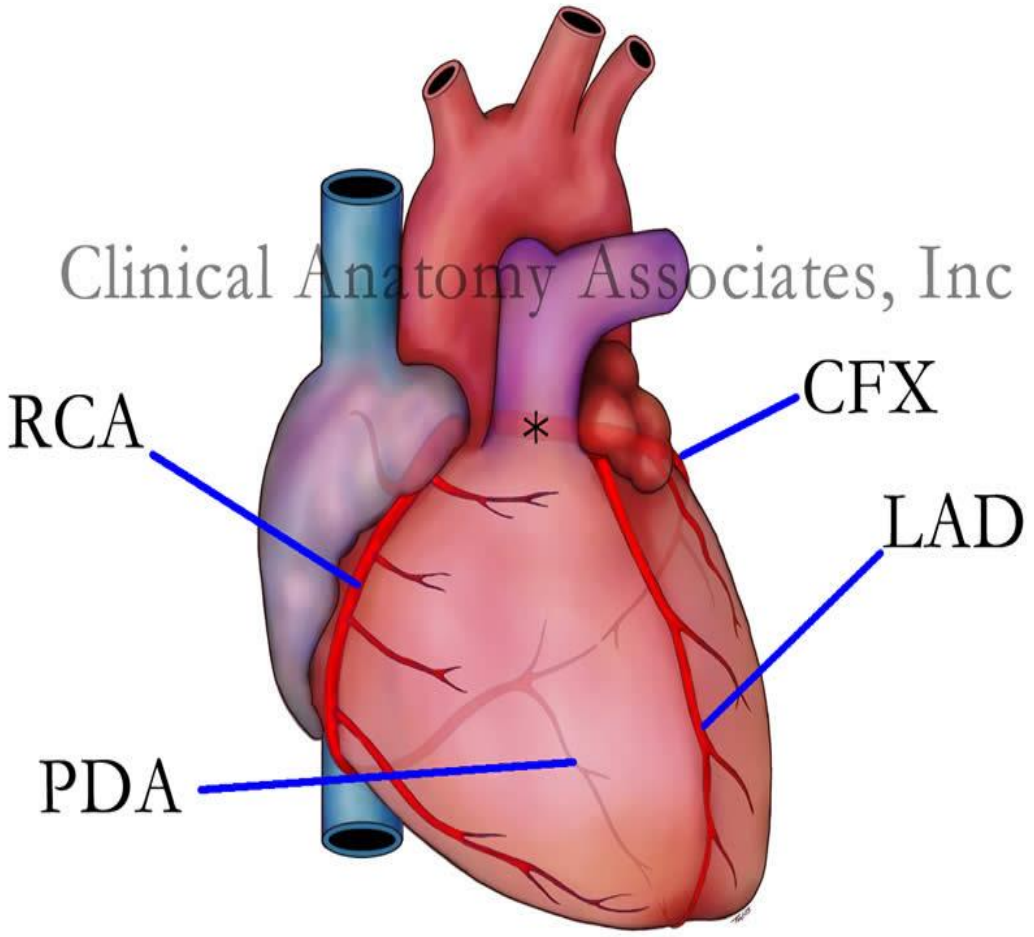


Sơ lược tương đối WSS của LAD được tái cấu trúc 3 chiều trong quá trình tâm thu từ 1 bệnh nhân với bệnh cảnh cầu cơ. Đoạn gần và xa cho thấy WSS tương đối thấp so với đoạn bị bắt cầu.
-LAD: left anterior descending, S1: first septal branch, WSS: wall shear stress

Michel T Corban et al. Myocardial Bridging : Contemporary Understanding of Pathophysiology With Implications for Diagnostic and Therapeutic Strategies. J Am Coll Cardiol, 10 June 2014; 63(22) : 2346–2355

DỊCH TỄ

- Vị trí thường gặp nhất của cầu cơ mạch vành là đoạn 1/3 giữa nhánh liên thất trước (LAD)



DỊCH TỄ

- ✓ Cầu cơ mạch vành là bệnh bẩm sinh, lần đầu được mô tả bởi BS Reymann năm 1737.
- ✓ Tỉ lệ gặp cầu cơ lúc mổ tử thi thay đổi từ 15-85%.
- ✓ Trong khi đó tỉ lệ chụp mạch cản quang phát hiện chiếm khoãng 0.5-2.5%, lần đầu được thực hiện bởi Bs Porstmann vào năm 1960

Nguyễn Ngọc Quang, Phạm Mạnh Hùng, Nguyễn Lân Hiếu. Cầu cơ của động mạch vành. Tạp chí Tim mạch học Việt Nam 2003, số 34 : 9-12.

NGHIÊN CỨU CẦU CƠ TIM ĐỘNG MẠCH VÀNH NGƯỜI VIỆT NAM

Nguyễn Hoàng Vũ, Dương Văn Hải*, Trần Minh Hoàng***

TÓM TẮT

Mục tiêu: *Khảo sát cầu cơ tim động mạch vành.*

Đối tượng và phương pháp nghiên cứu: *60 quả tim của thi thể đã được ướp dung dịch bảo quản tại bộ môn Giải phẫu học, Đại học Y Dược Thành phố Hồ Chí Minh. Tim được phẫu tích bộc lộ động mạch vành, khảo sát tần suất xuất hiện, vị trí, độ dài cầu cơ tim, khảo sát mối tương quan giữa cầu cơ tim và sự hiện diện của nhánh trung gian.*

Thiết kế nghiên cứu: *Cắt ngang mô tả.*

Kết quả: *Có tất cả 48 cầu cơ tim hiện diện ở 33 quả tim. Vị trí cầu cơ tim gặp nhiều nhất là ở rãnh gian thất trước, kế đến là rãnh gian thất sau. Chiều dài trung bình của cầu cơ tim là 20,62±9,56mm, ngắn nhất là 6,5 và dài nhất là 41,5mm,. Có sự liên quan giữa cầu cơ tim và nhánh trung gian.*

Kết luận: *Cầu cơ tim là một dạng biến đổi (variant) thường gặp của động mạch vành. Vị trí thường gặp nhất lả ở động mạch gian thất trước và động mạch gian thất sau. Nó có thể gây ra các dấu hiệu lâm sàng của bệnh động mạch vành và gây khó khăn cho các thủ thuật trên động mạch vành.*

Từ khóa: *cầu cơ tim, động mạch gian thất trước, động mạch gian thất sau, nhánh trung gian.*

Tác giả	Số mẫu nghiên cứu	Số mẫu có cầu cơ tim (Tỷ lệ%)	Tổng số cầu cơ tim
Ferrerial et al[1]	90	50 (55,6%)	70
Loukas M et al[7]	200	69 (34,5%)	81
Saidi H et al[10]	109	46 (42,4%)	
Shabestari AA et al[11]	2697	576 (21,3%)	579
Vũ D. Tùng và cs[17]	1108	118 (10,65%)	118
Nghiên cứu này	60	33 (68,75%)	48

(Nghiên cứu của Shabestari và của Vũ Duy Tùng thực hiện trên MSCT, các nghiên cứu còn lại thực hiện trên tim đã ướp formol phẫu tích).

Prevalence and characteristics of myocardial bridge in patients undergoing percutaneous coronary angiography

BS Nguyễn Văn Tuấn - BVQY 103

SUBJECTS AND METHODS

❖ *SUBJECTS*

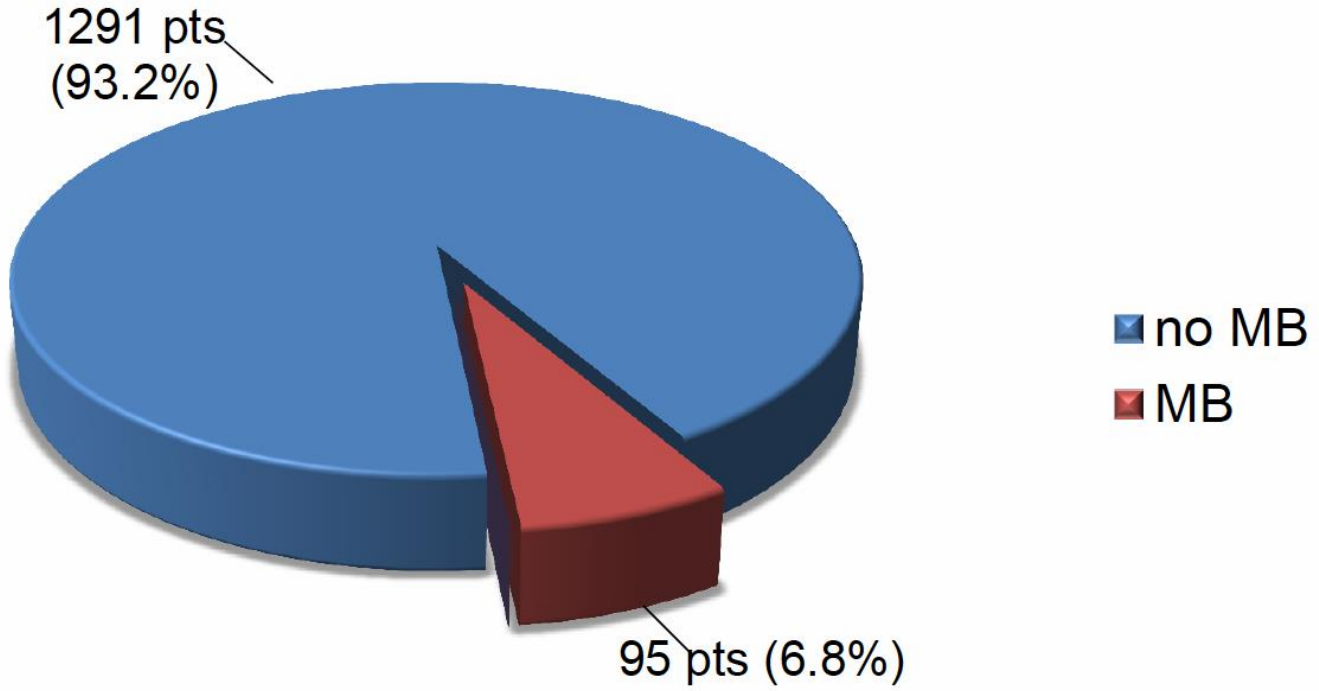
1386 patients underwent PCA in Department of Cardiology, Military Hospital 103 from 1/2013 to 3/2016

❖ *METHODS*

- Descriptive, cross – sectional.
- Clinical and paraclinical examination
- Percutaneous coronary angiography (PCA)

RESULTS

Chart 1. Myocardial bridge prevalence



. John R. Kramer (1982): 12% (PCA)
. Atar E (2007): 17% (MSCT)
. Lazoura O (2010): 21% (MSCT)

CHẨN ĐOÁN

Không có tiêu chuẩn vàng chẩn đoán trên lâm sàng do đó phải phối hợp dựa vào:

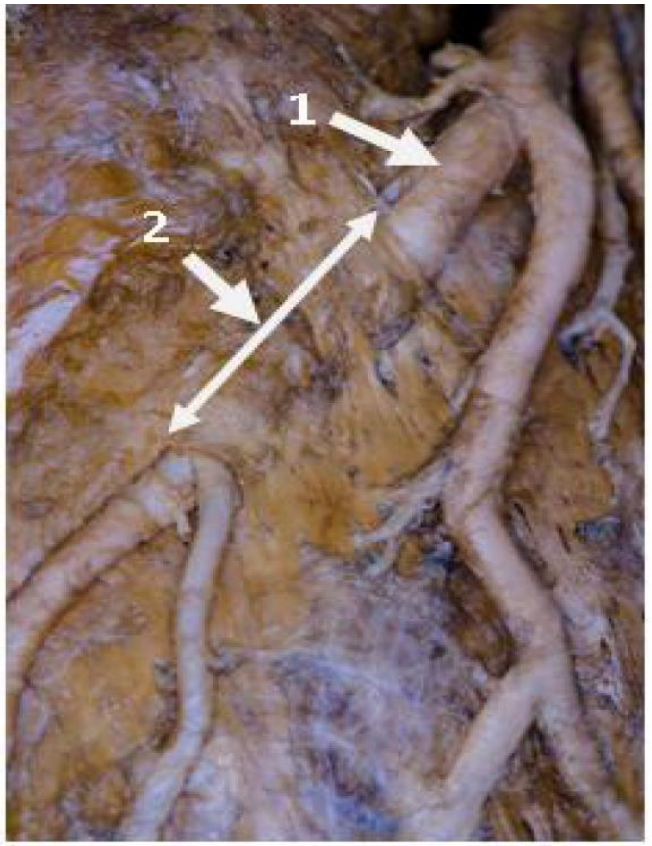
- ✓ Triệu chứng lâm sàng : 1/3 trường hợp không có triệu chứng.
- ✓ Các xét nghiệm chẩn đoán hình ảnh học và dòng chảy mạch vành.

Triệu chứng lâm sàng

- Myocardial ischemia (21),
- Acute coronary syndromes (22-24),
- Coronary spasm (21,25),
- Exercise-induced dysrhythmias like supraventricular tachycardia (24),
- Ventricular tachycardia (26,27)
- Atrioventricular conduction block (28),
- Transient ventricular dysfunction (30),
- Syncope (24,27)
- or even Sudden death (31,32)

CẬN LÂM SÀNG

Cận lâm sàng chẩn đoán : sinh thiết



Hình 1: *Cầu cơ tim trên động mạch gian thất trước1. ĐM gian thất trước2. Phần cơ tim phủ ngang qua một đoạn động mạch*

Cận lâm sàng chẩn đoán

- ✓ ECG, Stress Tests
- ✓ MSCT
- ✓ Doppler Flow Quantitative analysis (Finger tip phenomenon
- ✓ IVUS (Half moon)

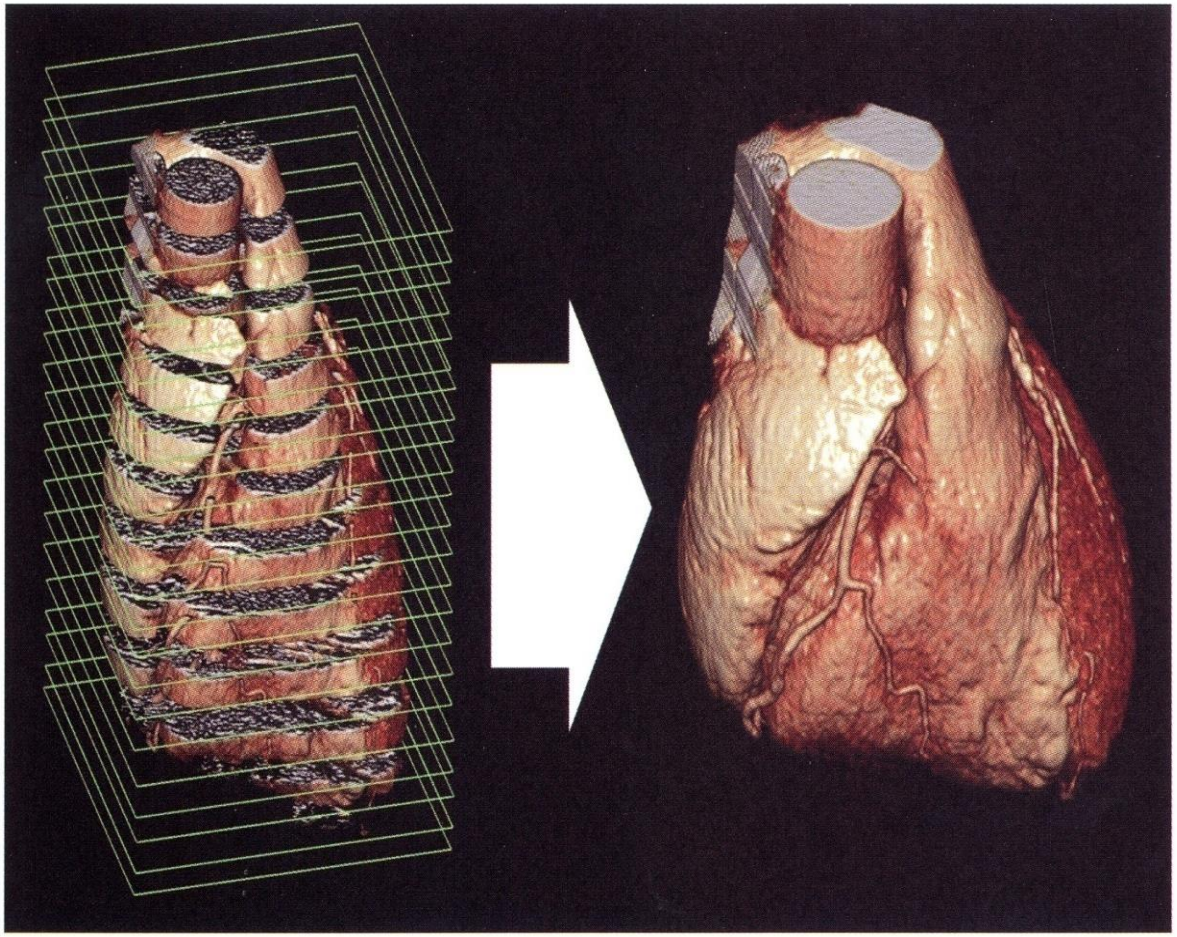
Michael S. Lee et al. Myocardial Bridging: An Up-to-Date Review. J Invasive Cardiol. 2015 Nov;27(11):521-528

TABLE 1 Myocardial Bridging and Imaging Modalities

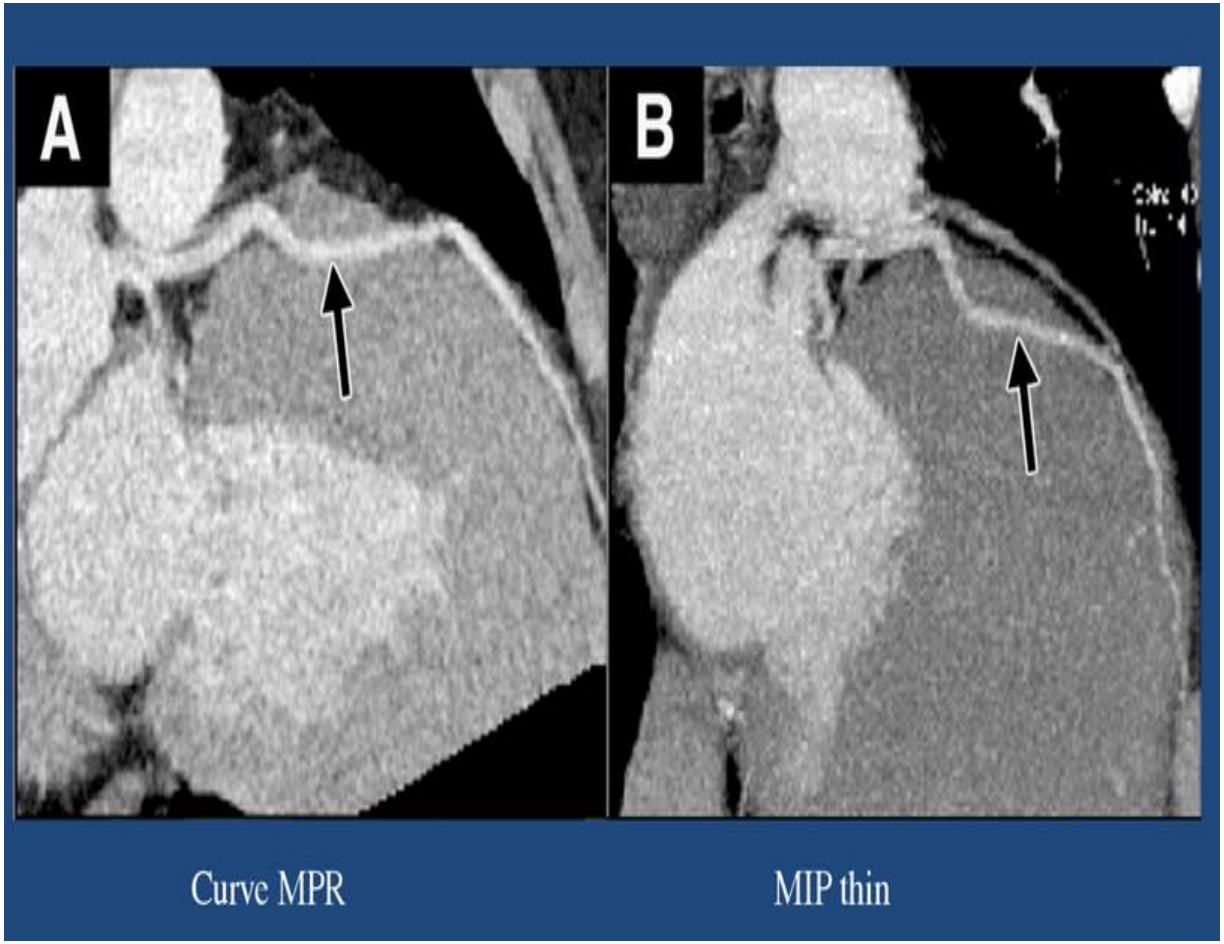
Imaging Modality	Description	Semiology	Diagnostic Criteria	Pros	Cons	X-Rays	Contrast	Pharm Stress
Invasive								
CAG	Invasive technique using selective catheterization of coronary arteries.	2D visualization of the anatomy of the coronary arteries through luminography that allows the measurements of lumen diameter.	Milking effect	Most frequently used. Anatomic/dynamic assessment.	No functional value	++	++	–
IVUS	Invasive technique using selective catheterization of coronary arteries, and insertion of the probe across the region of interest.	3D visualization of the anatomy of the coronary artery that allows accurate measurements of lumen diameter/area and of the vessel wall.	Half-moon	Identify: • Proximal plaque • Negative arterial remodeling • Extent of phasic arterial compression	Not commonly used No functional value	+++	++	–
Intracoronary Doppler	Invasive technique using selective catheterization of coronary arteries and insertion of a wire across the region of interest.	Evidence of specific altered functional patterns of hemodynamic significance associated with MB.	Fingertip	• Functional evaluation of coronary lesions and microvascular disease • Simulation of dynamic myocardial obstruction • Endothelial function testing/coronary vasospasm assessment.	Longer procedural time Pharmacological side effects. No standard cutoff with Ade or Dob Off-label use of acetylcholine	+++	++	++
FFR	Invasive technique using selective catheterization of coronary arteries and insertion of a wire across the region of interest.	Determination of a reduction of the ratio between the maximum achievable blood flow in a diseased coronary artery and the theoretical maximum flow in a normal coronary artery.	FFR <0.75-0.80	Functional evaluation of: • Fixed lesions (gold standard) • Dynamic coronary obstruction	Longer procedural time Adenosine is mandatory Pharmacological side effects Pd/Pa as average of systole and diastole	+++	++	++; Ade
iFR	Invasive technique using selective catheterization of coronary arteries and insertion of a wire across the region of interest.	Ratio of proximal and distal coronary pressures over the wave-free period in diastole.	iFR <0.86 (gray zone 0.86-0.93)	Functional evaluation of: • Fixed lesions • Dynamic coronary obstruction Diastolic specific index Ade not mandatory	Longer procedural time Further validation needed	+++	++	+/–
Noninvasive								
CCT	3D noninvasive technique performed on outpatient basis; not technically different from any other contrast-enhanced CT.	Accurate visualization of the course of coronary arteries into the epicardial fat and within the myocardial wall; can define degree of radial involvement of coronary wall and myocardial wall.	At least 1mm of myocardium covering the coronary artery (i.e., deep intramyocardial course).	More accurate than angiography. Shows atherosclerosis within the coronary segment. Widely tested for the detection and definition of MBs.	Not readily available No functional value	+	++	–
TAG	Noninvasive technique performed on outpatient basis; not technically different from any other contrast-enhanced CT.	Linear regression coefficient between luminal attenuation and axial distance from the coronary ostium.	Drop in HU per 10 mm length of coronary artery; variable thresholds depending on different methods	The same of CCT + additional functional assessment at rest.	Not tested on MBs	+	++	–
FFRct	Noninvasive technique performed on outpatient basis; not technically different from any other contrast-enhanced CT.	CT-derived computational fluid dynamics application. Resembles invasive FFR concept. Not performed during stress.	FFR <0.75-0.80	The same of CCT + additional functional assessment at rest.	Not tested on MBs	+	++	–

Tirantini et al. Left anterior descending artery myocardial bridging : a clinical approach. 27 Dec 2016 JACC 68;25: 2887-2899

MSCT 64-128 lát cắt



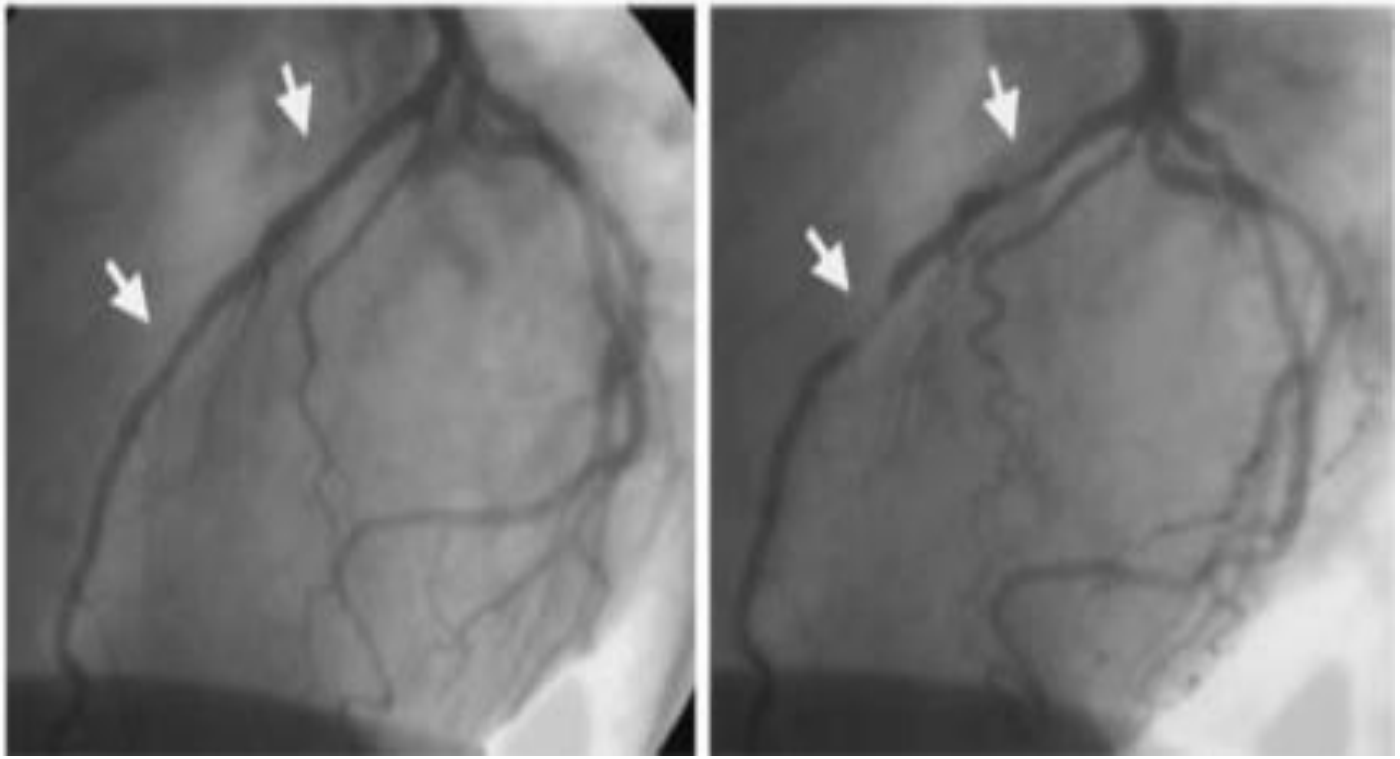
MSCT 64-128 lát cắt



CHỤP MẠCH VÀNH

- Chụp mạch vành hiện nay vẫn là **kỹ thuật thường dùng** để chẩn đoán cầu cơ mạch vành
- Dấu hiệu gián tiếp của cầu cơ mạch vành " milking-effect " hoặc "step down step up "
- Ở những bệnh nhân với cầu cơ mỏng, dấu hiệu "milking effect" có thể bị bỏ qua, và khi đó những kĩ thuật hình ảnh như IVUS, MSCT và Test Provocation bằng Acetylcholin hoặc Ergovonin có thể xác định.

Schwarz ER, Gupta R, Haager PK, vom Dahl J, Klues HG, Minartz J, Uretsky BF. Myocardial bridging in absence of coronary artery disease: proposal of a new classification based on clinical-angiographic data and long-term follow-up. Cardiology. 2009; 112(1):13-21.



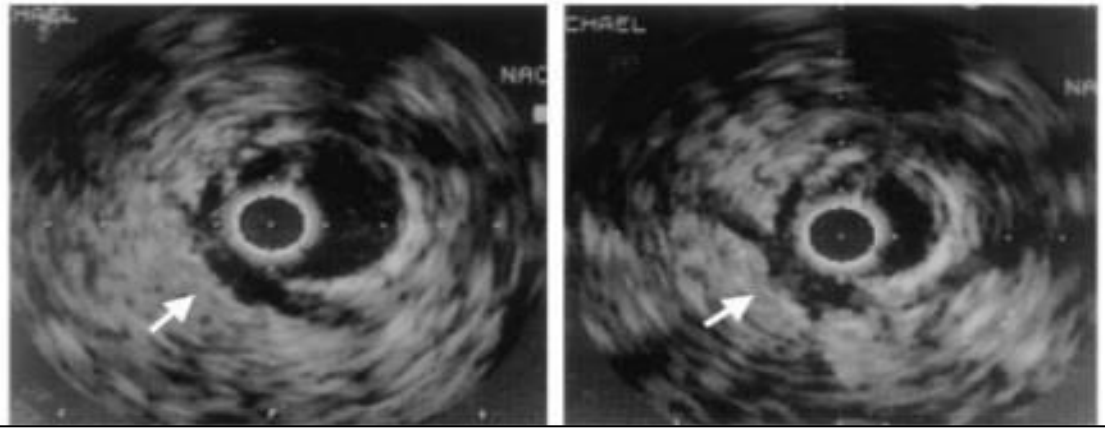
Tâm trương **Tâm thu**

Trong thì tâm thu, hình ảnh đoạn giữa nhánh liên thất trước bị đè ép tại vị trí mũi tên. Kích thước lòng mạch trong thì tâm trương bình thường. Các nhánh mạch vành cho thấy không có những dấu hiệu chụp mạch của xo vũa động mạch vành.

Source: Myocardial Bridging by Stefan Möhlenkamp, MD; Waldemar Hort, MD; Junbo Ge, MD; Raimund Erbel, MD, 2002; Circulation. 2002;106:2616-2622

SIÊU ÂM NỘI MẠCH (IVUS)

- ✓ Hình ảnh nửa vầng trăng (haft-moon) : **chuyên biệt cho sự tồn tại của cầu cơ xuất hiện cả thì tâm thu và thì tâm trương (khác với CMV)**
- ✓ Loại trừ hẹp do mảng xơ vữa và tìm mảng xơ vữa tại các vị trí gần cầu cơ.



Tâm trương **Tâm thu**

Những hình ảnh của cầu cơ trong suốt thì tâm trương (trái) và tâm thu (phải). Hình ảnh giống "nửa vầng trăng" xung quanh đoạn động mạch dưới cầu cơ hiện diện trong suốt chu kì tim.

Source: Myocardial Bridging by Stefan Möhlenkamp, MD; Waldemar Hort, MD; Junbo Ge, MD; Raimund Erbel, MD, 2002; Circulation. 2002;106:2616-2622

ĐO VẬN TỐC DÒNG CHẢY MẠCH VÀNH

Neth Heart J (2013) 21:6–13

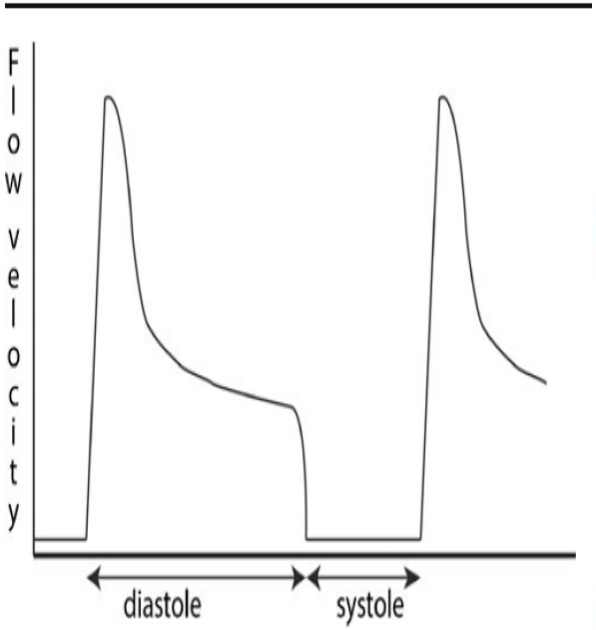


Fig. 2 Diagram of flow velocity in the tunnelled segment demonstrating a 'finger-tip' pattern. The high flow velocity in early diastole (the finger) indicates that at that moment in the cardiac cycle the tunnelled segment is still narrowed [30, 32]. The coronary flow velocity is minimal during systole

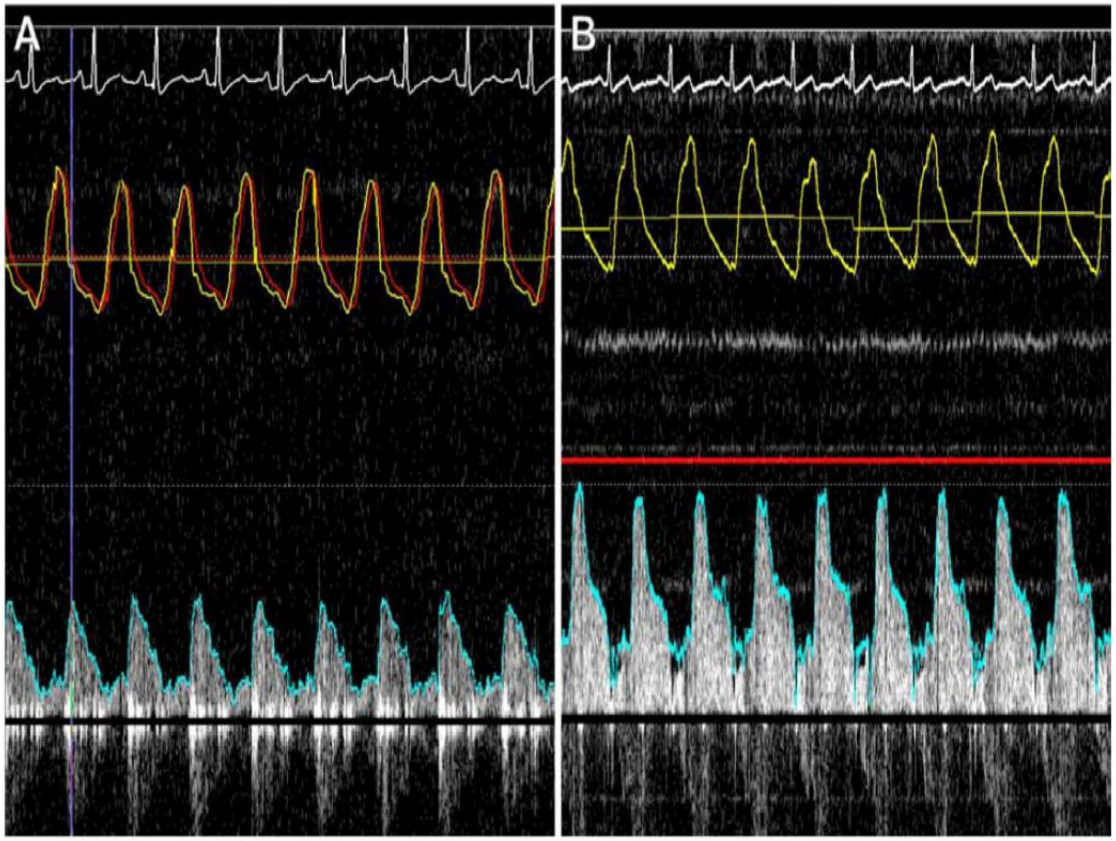


Figure 6. Finger Tip Phenomenon During Intracoronary Doppler Measurements
A: Example of normal flow pattern. ***B:*** Example of the "finger tip" phenomenon, a characteristic velocity profile demonstrating abrupt early diastolic acceleration, rapid mid-diastolic deceleration, and mid-to-late diastolic plateau.

FFR WITH DOBUTAMINE

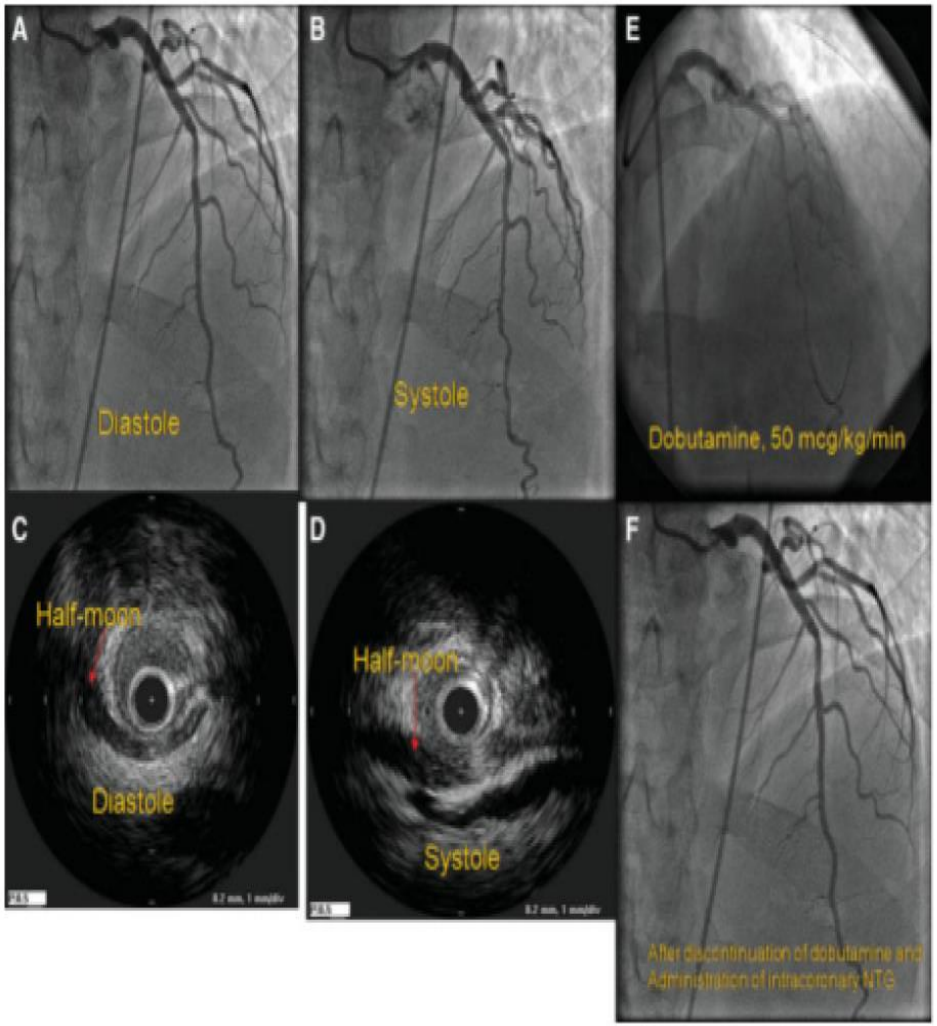


Fig. 3. Panels 3A and B, demonstrate MB in the LAD during diastole and systole at baseline; panel 3C and D, demonstrate IVUS images of MB during diastole and systole; panel 3E, demonstrates diffuse narrowing of the LAD after dobutamine infusion at 50 μg/kg/min; panel 3F, demonstrates resolution of diffuse narrowing of the LAD after intracoronary nitroglycerin administration. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

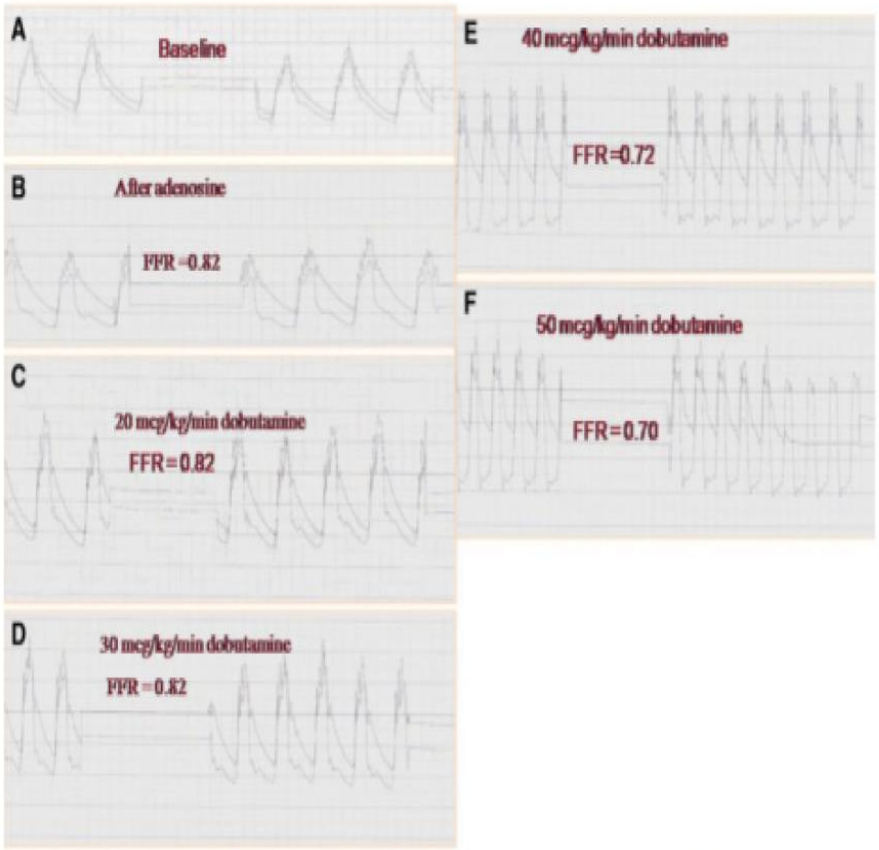


Fig. 4. Panel 4B, demonstrates FFR = 0.82 after adenosine infusion; panels 4C and 4D, demonstrate FFR = 0.82 after dobutamine infusion at 20 and 30 μg/kg/min; panel 4E, demonstrates FFR = 0.72 after dobutamine infusion at 40 μg/kg/min; panel 5F, demonstrates FFR = 0.70 after dobutamine infusion at 50 μg/kg/min. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

Hakeem et al, Catheterization and Cardiovasc Int, 2010

Comparison of Myocardial Bridging by Dual-Source CT With Conventional Coronary Angiography

Guang-Ming Lu, MD; Long-Jiang Zhang, MD; Hua Guo, MS*;
Wei Huang, MD; Reto D. Merges, MS**

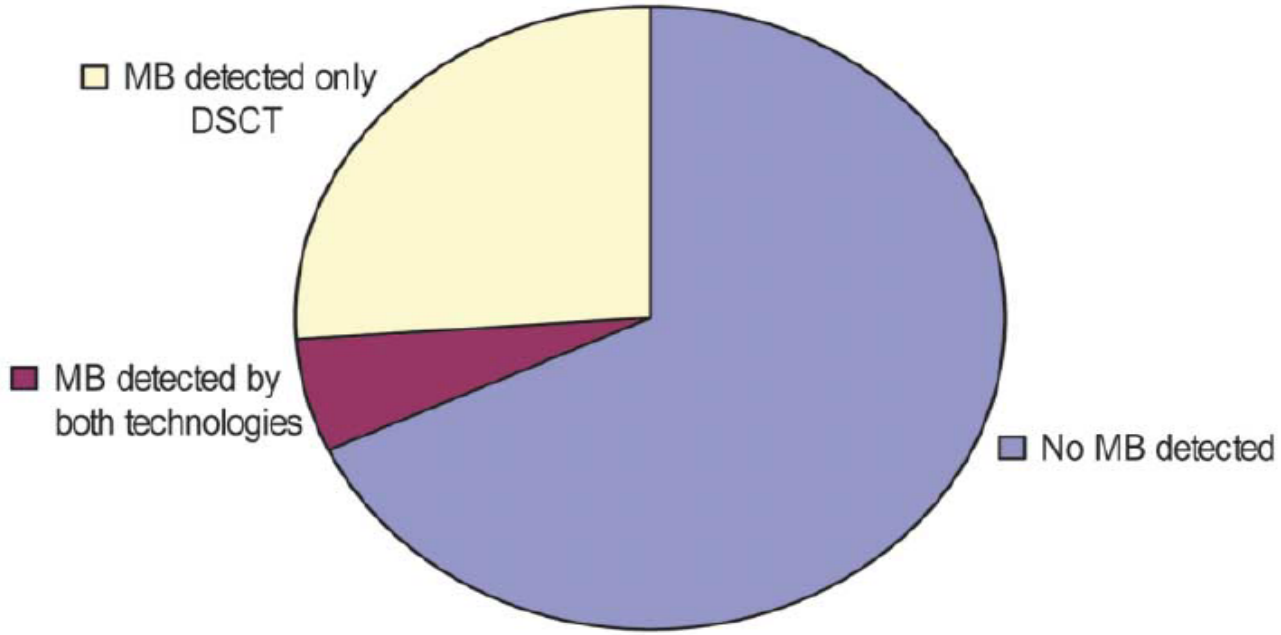
Background The diagnosis of myocardial bridging (MB) is of clinical importance because of the association between MB and compromised coronary flow. The aim of this study was to compare the ability of dual-source computed tomography (DSCT) and conventional coronary angiography (CAG) to detect MB.
Methods and Results DSCT were performed in 53 patients and 4-dimensional (D) reconstruction was subsequently performed in 16 patients with MB for double-blinded comparison with the findings of CAG. The diameters at systole and diastole of the coronary segments proximal and distal to the MB and of the tunneled segment were measured. The relationship between the rate of stenosis of the tunneled artery and the "milking" effect on 4-D reconstruction was analyzed. Of the 53 patients, CAG and DSCT detected 4 MBs in 3 patients and 21 MBs in 16 patients, respectively ($p<0.001$). On a per-patient and per-MB basis, significant difference was found between both methods ($p=0.001$, $p<0.001$). The 4-D reconstruction showed the milking effect and abnormal blood flow, detecting more MBs than did CAG ($p<0.001$). The rate of stenosis of the tunneled artery was related to the milking effect on the 4-D reconstruction ($r=0.640$, $p=0.006$).
Conclusions In the present study, DSCT detected more MBs than CAG, suggesting its clinical application for diagnosis of this condition. (*Circ J* 2008; **72:** 1079–1085)

Key Words: Angiography; Coronary artery disease; Myocardial bridging; X-ray computed tomography

Table 1 Comparison of DSCT and CAG for the Detection of MB

Index	*CAG*	*DSCT*	*χ^2 value*	*p value*
Patient basis (n=53)	*3*	*16*	*10.837*	*0.001*
MB basis (n=21)	*4*	*21*	*25.322*	*0.000*

DSCT, dual-source computed tomography; CAG, coronary angiography; MB, myocardial bridging.



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Available online at: onlinelibrary.wiley.com

PAPER

PATHOLOGY/BIOLOGY

Sorin Hostiuc,[1] M.D., Ph.D.; Ionuț Negoi,[2] M.D., Ph.D.; Mugurel C. Rusu,[3,4] M.D., Dr. Hab.; and Mihaela Hostiuc,[5] M.D., Ph.D.

Myocardial Bridging: A Meta-Analysis of Prevalence

ABSTRACT: The main objective of this article was to analyze prevalence data about myocardial bridging (MB) in published studies. To this purpose, we performed a meta-analysis of studies published in English literature that contained data about the prevalence of MB and its anatomical characteristics. The overall prevalence was 19% (CI: 17–21%); autopsy studies revealed an overall prevalence of 42% (CI: 30–55%), CT studies 22% (CI: 18–25%), and coronary angiography 6% (CI: 5–8%). Most bridges were located on the left anterior descending artery (82% overall, 63% on autopsy studies), had a mean thickness of 2.47 mm and a mean length of 19.3 mm. In conclusion, autopsy studies should be the gold standard in evaluating the actual prevalence of myocardial bridges, while in vivo high-resolution CT scanning should be preferred to coronary angiography studies.

KEYWORDS: forensic science, myocardial bridging, meta-analysis of prevalence, autopsy, computed tomography, coronary angiography, length of myocardial bridges

The human coronaries usually have a subepicardial course. However, sometimes there is a partial or total encasement of these arteries by myocardial fibers, a condition known under the name "myocardial bridging (MB)." Its prevalence, in different studies, ranges from 0.004% (1) to over 80% (2,3). Most authors suggested that MB is a benign condition, even though some found a positive correlation with myocardial ischemia (4–7), AMI (8), or other major adverse cardiac events (9,10). In forensic autopsies, it is sometimes considered a cause of sudden death and is often reported as such in scientific articles, especially in association with other congenital cardiac or coronary anomalies (11–20). It is considered an inborn anomaly, being found in studies on human fetuses (21), and it appears to reflect particular developmental processes within the heart (22). The description of the morphological characteristics of MBs is extremely heterogeneous in the scientific literature. Some authors find MB to be quasi-ubiquitous, while others suggest it is extremely rare; some suggests it is present almost exclusively on the left anterior descending (LAD) artery (23,24), while others find it often in other coronary arteries (especially marginal and diagonal) (25,26); some found increased atherosclerosis associated with MB (27), while others suggest that bridged segments are less prone to it (8,28). Most likely, an important part of this heterogeneity is caused by the technical limits of the methods used to assess MB. The main objective of this article was to analyze prevalence data about MB in published studies. Secondary objectives were (1) to describe the distribution and morphological characteristics of MBs and (2) to compare the usefulness of different methods (multidetector computed tomography, autopsy, coronary artery angiography) in assessing the prevalence of MB.

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Materials and Methods

We performed the study according to the PRISMA guidelines for reporting systematic reviews and meta-analyses of observational studies in epidemiology.

Selection Criteria

Inclusion criteria: studies that contained data from which we were able to estimate the prevalence of MB on various population groups. We used as exclusion criteria: (i) the absence of relevant information to reconstruct the data needed for analysis; (ii) studies not published in English; (iii) studies with less than 30 subjects; (iv) case series/case reports; (v) articles not found in online databases.

Search Method

We analyzed the results obtained from three databases: Web of Science, Scopus, and PubMed, by using the following keywords: "myocardial bridging," "mural coronary," with a timeframe that ranged from the beginning of each database to 2016. We preferred not to use additional, restrictive criteria (e.g.,

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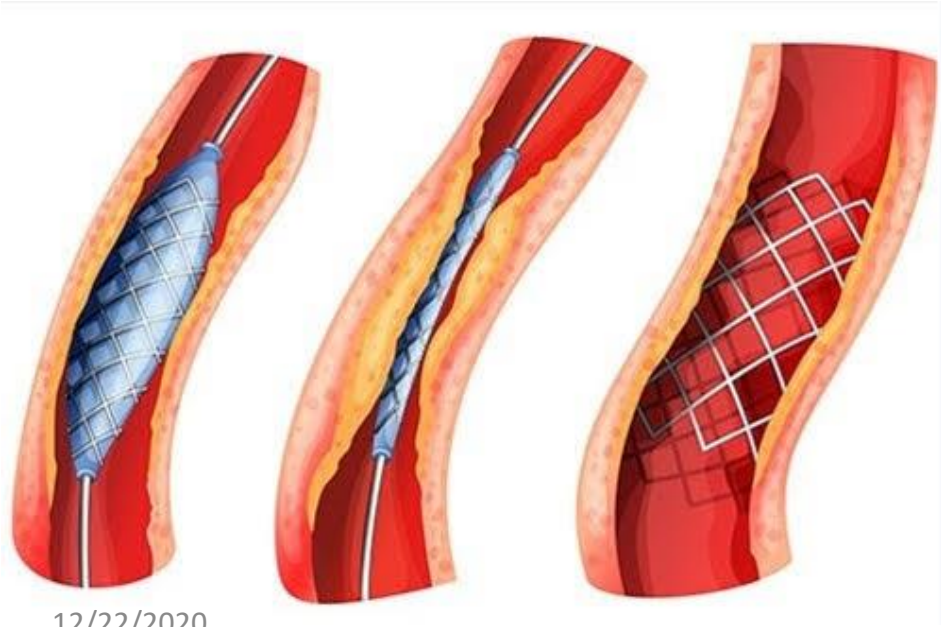
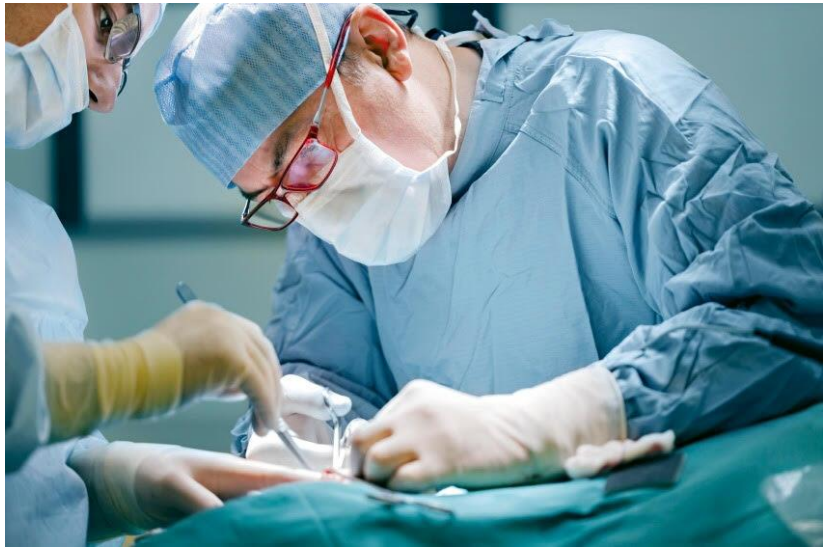
ABSTRACT: The main objective of this article was to analyze prevalence data about myocardial bridging (MB) in published studies. To this purpose, we performed a meta-analysis of studies published in English literature that contained data about the prevalence of MB and its anatomical characteristics. The overall prevalence was 19% (CI: 17–21%); autopsy studies revealed an overall prevalence of 42% (CI: 30–55%), CT studies 22% (CI: 18–25%), and coronary angiography 6% (CI: 5–8%). Most bridges were located on the left anterior descending artery (82% overall, 63% on autopsy studies), had a mean thickness of 2.47 mm and a mean length of 19.3 mm. In conclusion, autopsy studies should be the gold standard in evaluating the actual prevalence of myocardial bridges, while in vivo high-resolution CT scanning should be preferred to coronary angiography studies.

ĐIỀU TRỊ





ĐIỀU TRỊ

Cho đến hiện nay vẫn chưa có các nghiên cứu lớn, ngẫu nhiên, mù đôi, đa trung tâm, đa quốc gia về hiệu quả điều trị bệnh lý cầu cơ động mạch vành.

Cho nên vẫn chưa có những khuyến cáo chính thức từ Hội Tim mạch Mỹ (ACC/AHA) và Hội Tim mạch Châu Âu (ESC).

Chính vì vậy phác đồ điều trị chung nhất hiện nay vẫn phải dựa theo Phác đồ của tác giả Schwarz.

Table 1

Proposed classification scheme and therapeutic strategy for myocardial bridging (adapted from Schwartz et al).[66]

	Clinical Symptoms	Signs of Ischemia	Initial Treatment Strategy	Secondary Treatment if No Improvement
Type A	Yes	No	Reassurance	–
Type B	Yes	Yes, by non-invasive stress testing	Beta-blockers[b]	Intracoronary hemodynamic evaluation[a] → surgery or stenting if abnormal
Type C	Yes	Yes, by altered intracoronary hemodynamics[a]	Beta-blockers[b]	Surgery or stenting

[a]By quantitative coronary arteriography, fractional flow reserve, or intracoronary Doppler.
[b]If beta-blockers are contraindicated, non-dihydropyridine calcium-channel blockers can be used.

Schwarz ER, Gupta R, Haager PK, vom Dahl J, Klues HG, Minartz J, Uretsky BF. Myocardial bridging in absence of coronary artery disease: proposal of a new classification based on clinical-angiographic data and long-term follow-up. Cardiology. 2009; 112(1):13-21.

Documentation of ischemia at noninvasive stress testing puts patients in class B, which encompassed 62 patients. Chronic beta blockade is their treatment of choice, Schwarz said. "Beta blockers reduce the systolic compression and prolong the duration of the diastolic phase and that way improve perfusion and reduce ischemia."

> “Stenting would not be the first choice, but in some patients that's the only way to avoid ischemia, reduce symptoms, and reduce risk from the bridges.”

Class C accounted for 37 patients in the analysis; they may or may not have had objective evidence of ischemia at noninvasive testing but had significantly increased blood flow velocity and delayed diastolic relaxation in the bridged segment in intracoronary Doppler studies. Schwarz described another characteristic finding, at least during vasodilator-provocation IVUS studies: total compression of the bridged segment at systole, with complete loss of lumen.

Schwarz ER, Gupta R, Haager PK, vom Dahl J, Klues HG, Minartz J, Uretsky BF. Myocardial bridging in absence of coronary artery disease: proposal of a new classification based on clinical-angiographic data and long-term follow-up. Cardiology. 2009; 112(1):13-21.

Online Table 2. Studies of Surgical Intervention for Myocardial Bridging.

First Author, Year (Ref.#)	Study Cohort	Intervention	Follow-up Period	Immediate post-operative complications	Follow-Up Results
Iversen S et al., 1992 (1)	MB (n = 9)	Myotomy	In-hospital	2 patients with right ventricular perforation	No MACE
Rezayat P et al., 2006 (2)	MB (n = 26)	Myotomy	Mean 34.2 months	1 patient had post-operative angina who underwent CABG with LIMA graft because of narrowing in the LAD	2 patients were treated medically because of angina No MACE
Wan L et al., 2005 (3)	MB (n =19)	8 CABG 7 myotomy 4 PCI	Mean 23.5 months	None	2 of 4 patients with PCI had ISR; one underwent CABG No MACE in surgical patients
Wu QY et al., 2007 (4)	MB (n = 31)	16 CABG 15 myotomy	Mean 31 months	1 patient with right ventricular perforation who underwent CABG	No MACE
Huang XH et al., 2007 (5)	MB (n = 11)	8 CABG with LIMA graft 3 myotomy	Median 35.3 months	1 patient with right ventricular perforation who underwent CABG	2 patients had atypical angina and were treated medically
Sun X et al., 2012 (6)	MB (n = 13)	CABG with LIMA graft	24-55 months	None	Non MACE
Bockeria LA et al., 2013 (7)	MB (n = 39)	CABG 19 with SVG 20 with LIMA graft	LIMA graft: 6-23 months SVG: 2-25 months	2 patients underwent repeat sternotomy for bleeding 2 patients required inotropes	6 patients had recurrent angina. Angiography revealed occlusion in 12 LIMA grafts and 3 SVGs

Michel T Corban et al. Myocardial Bridging : Contemporary Understanding of Pathophysiology With Implications for Diagnostic and Therapeutic Strategies. J Am Coll Cardiol, 10 June 2014; 63(22) : 2346–2355

Online Table 1. Studies of percutaneous coronary intervention for left anterior descending artery myocardial bridging

First Author, Year (Ref.#)	Study Cohort	Intervention	Follow-up Period	Results
Klues et al., 1997 (1)	MB (n = 3)	BMS	7 weeks	No ISR or MACE
Haager et al., 2000 (2)	MB (n = 11)	BMS	2 yrs	45% ISR (7 weeks)
Kursaklioglu et al., 2004 (3)	MB (n =12) Non-MB (n = 39)	BMS	6 months	ISR 67% in MB vs. 28% in non-MB
Kunamneni et al., 2008 (4)	MB (n = 12)	4 BMS 8 DES	1 yr	ISR 75% in BMS vs. 25% in DES
Tsujita et al., 2009 (5)	MB (n = 70) 34% of stents covering MB 66% of stents not covering MB	4 BMS 66 DES	1 yr	MB stent group: 33% MACE* Non-MB stent group: 11% MACE*
Ernst et al., 2013 (6)	MB (n = 15)	DES	5 yrs	1 perforation during stent implantation 19% ISR (6 months)
Schwarz et al., 2009 (7)	MB (n = 24)	BMS	2 yr	5 ISR (4 TVR) at 7 weeks
C-H Lee, et al., 2014 (8)	MB (n = 94)	DES	3 yr	TLR 8.5%, Id-TVR 13.8%

Michel T Corban et al. Myocardial Bridging : Contemporary Understanding of Pathophysiology With Implications for Diagnostic and Therapeutic Strategies. J Am Coll Cardiol, 10 June 2014; 63(22) : 2346–2355

Clinical Trial > Heart Lung Circ. 2014 Aug;23(8):758-63. doi: 10.1016/j.hlc.2014.02.021. Epub 2014 Mar 12.

Impact of myocardial bridging on the long-term clinical outcomes of patients with left anterior descending coronary artery disease treated with a drug-eluting stent

Chan-Hee Lee [1], Ung Kim [2], Jong-Seon Park [1], Young-Jo Kim [1]

Abstract

Background: Myocardial bridging (MB) is mostly confined to the left anterior descending coronary artery (LAD) and has been reported to be correlated with increased atherosclerotic plaques in the segment proximal to the bridging. This study aimed to assess the impact of MB on the clinical outcomes of patients with DES implantation in the LAD.

Methods: A total of 551 consecutive patients with DES implantation on LAD from January 2008 to December 2009 were included. Patients were divided into an MB group (n=94, 17.1%) and a non-MB group (n=457, 82.9%) based on angiographic findings. They were followed up for three years to evaluate major adverse cardiac events (MACE), which were defined as all-cause death, myocardial infarction (MI), target lesion revascularisation (TLR) or ischaemic driven target vessel revascularisation (Id-TVR).

Results: During three years of follow-up, the rate of MACE was significantly higher in the MB group than in the non-MB group (18.1% vs. 9.8%, p=0.024), especially rates of TLR (8.5% vs. 2.4%; p=0.003) and Id-TVR (13.8% vs. 4.2%; p<0.001). However, no difference was observed for MI (3.2 vs. 2.6%; p=0.692) and all-cause death rates (3.2 vs. 4.6%; p=0.575). Multivariate regression analysis showed that the presence of MB was an independent predictor for MACE (Hazard ratio 2.897, 95% CI 1.536 - 5.464, p=0.001).

Conclusion: MB appears to be associated with adverse effects in patients with DES implantation in the LAD.

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Myocardial Bridging: Contemporary Understanding of Pathophysiology with Implications for Diagnostic and Therapeutic Strategies

Michel T. Corban, MD[#*], Olivia Y. Hung, MD, PhD[#*], Parham Eshtehardi, MD[*], Emad Rasoul-Arzrumly, MD[*], Michael McDaniel, MD[*], Girum Mekonnen, MD, MPH[*], Lucas H. Timmins, PhD[†], Jerre Lutz, MD[*], Robert A Guyton, MD[‡], and Habib Samady, MD[*]

Conclusion

Myocardial bridging is a congenital anomaly in which an epicardial coronary artery takes an intramyocardial course. It is present anatomically in approximately 25% of patients based on autopsy and CT, but only results in angiographically detectable systolic compression in less than 10% of patients. Flow alterations from this condition can cause accelerated atherosclerosis in the coronary segment immediately proximal to the bridged segment. The bridged portion itself is "spared" from atherosclerosis, likely through favorable shear forces resulting in increased expression of vasoactive agents as well as morphological changes in endothelial and smooth muscle cells in the area. Hemodynamic effects of bridging include systolic coronary flow reversal proximal to the bridge, as well as a decrease in coronary flow reserve. Clinical consequences range from angina to acute coronary syndrome to sudden cardiac death. First-line therapy involves medical treatment with beta-blockers and non-dihydropyridine calcium-channel blockers, while nitrates are contraindicated due to secondary tachycardia and hypercontractility from reflex sympathetic activation. For refractory symptoms, multiple interventional strategies have been attempted such as surgical myotomy, coronary artery bypass surgery, and stenting. A prospective randomized trial is required to identify the best treatment strategy for patients with myocardial bridging.

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Myocardial Bridging: An Up-to-Date Review

Michael S. Lee, MD and **Cheng-Han Chen, MD**
UCLA Medical Center, Los Angeles, California

Conclusion

Patients with myocardial bridging are commonly encountered clinically who may present with exertional symptoms of myocardial ischemia, syncope, and even sudden death. An array of non-invasive and invasive diagnostic modalities that have shed light on the pathophysiology of myocardial bridging can be deployed to evaluate symptomatic patients. Medical therapy with β-blockers and calcium channel blockers remain the mainstay in treatment. For select patients refractory to intensified medical therapy, surgical intervention, or less preferably PCI with DES, can be considered. Larger registries and randomized clinical trials are warranted to shed light on optimal strategies for patients with myocardial bridging refractory to medical therapy.

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Review

An Updated Review on Myocardial Bridging

Ghulam Murtaza [a], Debabrata Mukherjee [b], Shahyar M. Gharacholou [c], Aravinda Nanjundappa [d], Carl J. Lavie [e], Abdul Ahad Khan [a], Madhan Shanmugasundaram [f], Timir K. Paul [a]

Percutaneous coronary revascularization

There are no randomized trials comparing medical therapy vs percutaneous coronary intervention (PCI) in patients with MB. Medical therapy with beta-blockers or CCB is the treatment of choice. However, in patients who continue to have significant symptoms refractory to medical therapy, other options should be considered. Intracoronary stent placement gives the lumen of bridged segment stability against external compression and improves coronary flow reserve [56]. However, PCI of bridged segments ...

An Updated Review on Myocardial Bridging

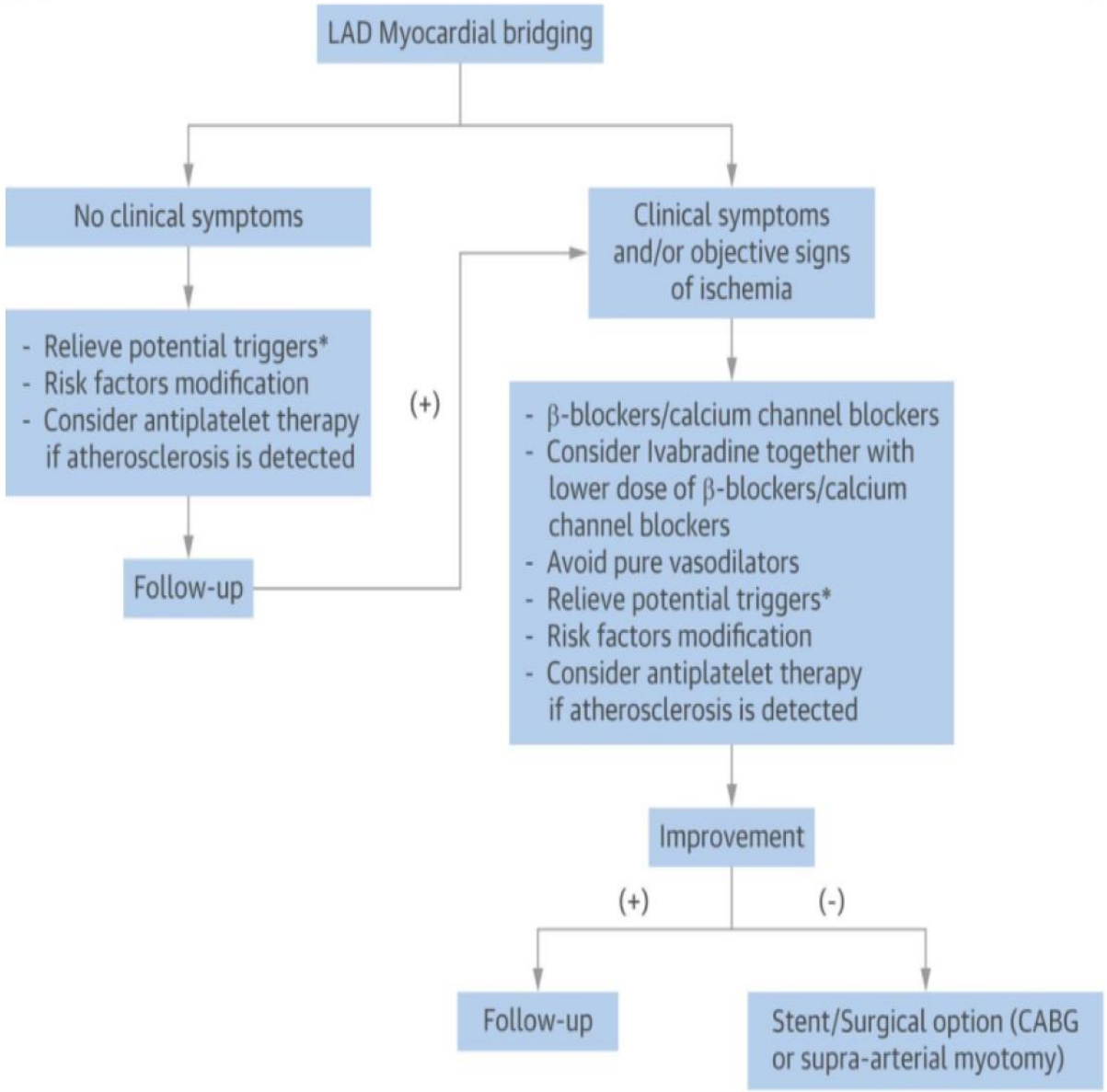
Posted: 11/30/2020

Author:
Ghulam Murtaza, Debabrata Mukherjee, Shahyar M. Gharacholou, Aravinda Nanjundappa, Carl J. Lavie, Abdul Ahad Khan, Madhan Shanmugasundaram and Timir K. Paul

2020 CRM

Abstract

Myocardial bridging is a congenital coronary anomaly with normal epicardial coronary artery taking an intra-myocardial course also described as tunneled artery. The majority of patients with this coronary anomaly are asymptomatic and generally it is a benign condition. However, it is an important cause of myocardial ischemia, which may lead to anginal symptoms, acute coronary syndrome, cardiac arrhythmias and rarely sudden cardiac death. There are numerous studies published in the recent past on understanding the pathophysiology, diagnostic and management strategies of myocardial bridging. This review highlights some of the recent updates in the diagnosis and management of patients with myocardial bridging. We discuss the role of various non-invasive and invasive diagnostic methods to evaluate functional significance of bridging. In addition, role of medical therapy such as beta-blockers, percutaneous coronary intervention with stents/bioresorbable scaffolds and surgical unroofing in patients unresponsive to medical therapy is highlighted as well.



Tarantini et al, JACC 2016

Kết luận (1)

- ✓ Bệnh cầu cơ động mạch vành là thường gặp, biểu hiện triệu chứng như bệnh tim thiếu máu cục bộ, nhồi máu cơ tim, ngất, rối loạn nhịp tim hay thậm chí đột tử. Trong đó, 1/3 số cas là không có triệu chứng.

- ✓ Về mặt chẩn đoán, ngoài sinh thiết ra thì trên lâm sàng là không có tiêu chuẩn vàng nên phải phối hợp triệu chứng lâm sàng và các phương pháp cận lâm sàng như CMV, MSCT, IVUS, FFR.

Kết luận (2)

- ✓ Về điều trị, hiện nay đều dựa trên phân typ Schwarz bao gồm đánh giá triệu chứng lâm sàng và các test cận lâm sàng để có hướng điều trị cụ thể.

- ✓ Điều trị nội khoa là điều trị cơ bản đầu tiên với chẹn beta hoặc chẹn canci. Tuy nhiên khi triệu chứng lâm sàng không cải thiện, không đáp ứng điều trị nội khoa, hoặc có cơn đau thắt ngực không ổn định, nhồi máu cơ tim, ngất hay rối loạn nhịp tim nguy hiểm thì đặt stent mạch vành hay phẫu thuật cần phải chỉ định.

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