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Valvular-ventricular interaction: the importance of the mitral chordae tendineae in terms of global left ventricular systolic function.

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While conventional mitral valve replacement (MVR) for patients with chronic mitral regurgitation has been associated with relatively high operative mortality rates and incidence of late postoperative left ventricular (LV) failure and death, chordal-sparing mitral valve operations (valve repair/reconstruction or MVR with preservation of the chordae tendineae) subjectively appear to portend lower operative morbidity and mortality rates, better functional results, and improved long-term survival rates. Such empirical clinical observations have provided the basis for the concept of valvular-ventricular interaction, namely, that the intact mitral chordae are important mediators of more efficient and forceful ventricular contraction that enhances LV performance. This paper reviews the pertinent basic physiology and dynamics of the chordae tendineae and papillary muscles and examines critically the available experimental and clinical data regarding valvular-ventricular interaction. The problems inherent in quantifying LV contractility are central to this discussion and are also examined. While earlier experimental studies have produced conflicting results, more recent experiments utilizing load-independent measures of ventricular performance (particularly in isovolumic preparations) have conclusively demonstrated the importance of chordal integrity for optimal LV systolic function in normal animal hearts. The balance of the clinical evidence is also suggestive (although by no means conclusive) regarding the importance of valvular-ventricular interaction. Recent experimental evidence suggests that the mitral chordae enhance LV systolic function by means of regional afterload reduction. The mechanism(s) responsible for valvular-ventricular interaction, however, remains incompletely characterized at the present time, which underscores the urgent need for further experimental and, most importantly, clinical studies.

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'+ToolTip+'; return; } if (PopupMenu2_default_config_tmp [PopupMenu2_FreeText_index][1] == "no") { if (PopupMenu2_default_config_tmp[PopupMenu2_FrameTarget_index][1] == "") { PopupMenu2_This_Frame_Target = ""; } else { PopupMenu2_This_Frame_Target = 'target="'+PopupMenu2_default_config_tmp [PopupMenu2_FrameTarget_index][1]+'"; } for (var i = PopupMenu2_linkArray_starts; i < PopupMenu2_linkArraytmp.length; i++) { PopupMenu2_linkArrayConstr = PopupMenu2_OnMouseOut_link = PopupMenu2_OnMouseOver_link = ""; PopupMenu2_linkArrayKey = PopupMenu2_linkArraytmp[i][0]; PopupMenu2_linkArrayKey_length = PopupMenu2_linkArraytmp [i][0].length; PopupMenu2_linkArrayValue = PopupMenu2_linkArraytmp[i][1]; PopupMenu2_linkArrayMOver = PopupMenu2_linkArraytmp[i][2]; PopupMenu2_linkArrayMOut = PopupMenu2_linkArraytmp[i][3]; if (PopupMenu2_linkArraytmp[i]) { if (PopupMenu2_linkArrayMOver) { PopupMenu2_OnMouseOver_link='onMouseOver="javascript:'+PopupMenu2_linkArrayMOver+' "; } if (PopupMenu2_linkArrayMOut) { PopupMenu2_OnMouseOut_link='onMouseOut="javascript:'+PopupMenu2_linkArrayMOut+' "; } if (PopupMenu2_linkArrayMaxlength < PopupMenu2_linkArrayKey_length) { PopupMenu2_linkArrayMaxlength = PopupMenu2_linkArrayKey_length; } if (PopupMenu2_linkArrayKey=="Help") { PopupMenuHelpLink = PopupMenu2_linkArrayValue; } else { if (PopupMenu2_linkArrayValue!="-" && PopupMenu2_linkArrayValue!="none") { if (PopupMenu2_linkArrayValue.indexOf("aname#") != -1) { PopupMenu2_linkArrayConstr = '+PopupMenu2_linkArrayKey+'; } else { if (PopupMenu2_linkArrayValue.substring(0, 11) != 'javascript:') { if (PopupMenu2_linkArrayValue.indexOf("window.") != -1 )
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false

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:"+PopupMenu2_linkArrayValue; } } PopUpMenu2_linkArrayConstr =
_linkArray_sum+="<div style=">"+PopupMenu2_linkArrayConstr+"";
/ separator cell if (PopupMenu2_linkArray_sum!="" )
Menu2_TotalSeparatorsCount++; } // name of new groups after separator if
pMenu2_linkArray_sum+=" "+PopupMenu2_linkArrayKey+" ";
if (!PopupMenu2_ShowTitle && PopUpMenuHelpLink != "none")
opUpMenu2_TotalLinksCount++; } } else { // Free Text PopUpMenu2_linkArray_sum =
Menu2_FreeText_index[1]+"; } // menu Height and Width calc. PopUpMenu2_inheight =
18 + 1 / * PopUpMenu2_TotalLinksCount; if (PopupMenu2_TotalSeparatorsCount > 0) PopUpMenu2_inheight += 4 *
PopUpMenu2_TotalSeparatorsCount; if (PopupMenu2_linkArrayMaxlength < 15 ) { PopUpMenu2_inwidth = 120; } else
{ PopUpMenu2_inwidth = 120 + (PopupMenu2_linkArrayMaxlength - 14) * 7; } } function buildText() { // !!! SINGLE QUOTES
INSIDE DOUBLE QUOTES. PopUpMenu2_text=""; if (PopupMenu2_ShowTitle) { PopUpMenu2_text="
"; PopUpMenu2_text+="
"; if (PopupMenuHelpLink != "none") { PopUpMenu2_text+="<div style=">"; } else { PopUpMenu2_text+=" "; } PopUpMenu2_text+=" "+PopU
"; } PopUpMenu2_text+="
"; PopUpMenu2_text+="
"; PopUpMenu2_text+="
"; PopUpMenu2_text+="
"; PopUpMenu2_text+="
"; PopUpMenu2_text+="PopupMenu2_linkArray_sum; PopUpMenu2_text+="
"; // document.write(PopUpMenu2_text); return PopUpMenu2_text; } function PopUpMenu2_doNOThideFunc()
{ PopUpMenu2_doNOThide = true; } function PopUpMenu2_Hide_Layer() { PopUpMenu2_Hide_It(PopUpMenu2_HideTime); }
function PopUpMenu2_Hide(ms) { if (PopupMenu2_timerID) { window.clearTimeout(PopUpMenu2_timerID); } if (!ms)
{ ms=PopupMenu2_HideTime; } PopUpMenu2_Hide_It(ms); } function PopUpMenu2_Hide_It(ms)
{ PopUpMenu2_milliseconds=parseInt(ms); if (PopupMenu2_milliseconds > 0) { PopUpMenu2_milliseconds -=
PopupMenu2_DelayTime; PopUpMenu2_timerID=window.setTimeout("PopUpMenu2_Hide_It
(PopUpMenu2_milliseconds)',PopUpMenu2_DelayTime); } else { PopUpMenu2_Stop(false); } } function
PopUpMenu2_showpopphelp() { if (PopupMenuHelpLink.indexOf("window.open()") != -1) { eval (PopupMenuHelpLink); } else
{ eval ("window.top.location="+PopupMenuHelpLink + ""); PopUpMenu2_Stop(true); } } function PopUp2WindowOpen
(url,name,attributes) { var PopUpWindowHandle; PopUpWindowHandle = window.open(url,name,attributes); } function
PopUpMenu2_ClearTime() { window.clearTimeout(PopUpMenu2_timerID); } String.prototype.Conf2Boolean = function() { return
~"1yiesldalsilrueolon".indexOf(this.toString().toLowerCase()); } function PopUpMenu2_Set_GlobalConfig() { if
(PopUpMenu2_GlobalConfig[0][0] == "UseThisGlobalConfig" && PopUpMenu2_GlobalConfig[0][1] == "yes") { // set global config
from PopUpMenu2_Set_GlobalConfig array for (var temp_i = 1; temp_i < PopUpMenu2_GlobalConfig.length; temp_i++) { for (var
temp_i2 = 0; temp_i2 < PopUpMenu2_default_config.length; temp_i2++) { if (PopUpMenu2_default_config[temp_i2][0] ==
PopUpMenu2_GlobalConfig[temp_i][0]) { PopUpMenu2_default_config[temp_i2][1] = PopUpMenu2_GlobalConfig[temp_i]
[1]; } } } } else { // use default global config return; } } /* This code places div and iframe in page after page load. */ if
(PopUpMenu2_menu_possible) { PopUpMenu2_Set_GlobalConfig(); if (PopupMenu2_iens6) { PopUpMenu.addEvent(window,
'load', function() { var body = document.getElementsByTagName("body")[0]; var div = document.createElement("div");
div.innerHTML = "
"; body.insertBefore(div.firstChild, body.firstChild); }); if (PopupMenu2_ie55 && !PopupMenu2_opera) { PopUpMenu.addEvent
(window, 'load', function() { var body = document.getElementsByTagName("body")[0]; var div = document.createElement("div");
div.innerHTML = "
"; body.insertBefore(div.firstChild, body.firstChild); }); } } // version 2.7.3 (01/04/2007) IE NS 6.X Browsers //
XHTML PoUpMenu position Fix // New Frame_Target param added // Fight with Safari by Full Merge function PopUpMenu2_Set
(PopUpMenu2_links_ids_line) { if (!PopupMenu2_menu_possible) { return; } PopUpMenu2_first_time=true; BuildLinks
(PopUpMenu2_links_ids_line); PopUpMenu2_boxposLR=PopupMenu2_default_config_tmp[PopupMenu2_AlignLR_index][1];
PopUpMenu2_boxposTB=PopupMenu2_default_config_tmp[PopupMenu2_AlignTB_index][1]; window.clearTimeout
(PopUpMenu2_timerID); PopUpMenu2_theobj=buildText(); if (document.getElementById)
{ PopUpMenu2_theobj=document.getElementById("PopUpMenu2viewer"); } else { return; } // if
(PopUpMenu2_iens6&&document.all) { // PopUpMenu2_theobj.innerHTML = "
"; // PopUpMenu2_theobj.insertAdjacentHTML
("BeforeEnd",
"+PopupMenu2_theobj.innerHTML = "
"; PopUpMenu2_theobj.innerHTML = "
"+PopupMenu2_theobj.innerHTML = "
"; } var PopUpMenu2_main_table=document.getElementById("Menu2_main_table") PopUpMenu2_inwidth =
PopUpMenu2_main_table.offsetWidth PopUpMenu2_inheight = PopUpMenu2_main_table.offsetHeight PopUpMenu2_browserHeight
= getViewportHeight(); PopUpMenu2_browserWidth = getViewportWidth(); var PopUpMenu2_ScrOffY = 0; var
PopUpMenu2_ScrOffX = 0; // Try to get the scrolls offsets if (typeof( window.pageYOffset ) == 'number' ) { //Netscape compliant
PopUpMenu2_ScrOffY = window.pageYOffset; PopUpMenu2_ScrOffX = window.pageXOffset; } else if( document.body &&
( document.body.scrollTop || document.body.scrollLeft ) ) { //DOM compliant PopUpMenu2_ScrOffY = document.body.scrollTop;
PopUpMenu2_ScrOffX = document.body.scrollLeft; } else if( document.documentElement &&
( document.documentElement.scrollTop || document.documentElement.scrollLeft ) ) { //IE6 standards compliant mode
PopUpMenu2_ScrOffY = document.documentElement.scrollTop; PopUpMenu2_ScrOffX = document.documentElement.scrollLeft; }
PopUpMenu2_scrollbaroff=1; if (PopupMenu2_ns6x) { PopUpMenu2_browserWidth=window.innerWidth;
PopUpMenu2_browserHeight=window.innerHeight; PopUpMenu2_ScrOffX=window.pageXOffset;
PopUpMenu2_ScrOffY=window.pageYOffset; PopUpMenu2_scrollbaroff=16; }
PopUpMenu2_boxPrePositionLR=PopupMenu2_boxposLR; PopUpMenu2_boxPrePositionTB=PopupMenu2_boxposTB; if (!
PopUpMenu2_center_offset) { if ( PopUpMenu2_browserHeight+PopUpMenu2_ScrOffY < window_pageY+PopUpMenu2_inheight )
{ PopUpMenu2_boxPrePositionTB="top" } if ( PopUpMenu2_browserWidth+PopUpMenu2_ScrOffX <
window_pageX+PopUpMenu2_inwidth ) { PopUpMenu2_boxPrePositionLR="left" } else if ( window_pageX+PopUpMenu2_inwidth
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(PopUpMenu2_boxPosition == "bottomleft") { window_pageX -= (PopUpMenu2_offsetx+2)+PopUpMenu2_inwidth; window_pageY
-= PopUpMenu2_offsety; } else if (PopUpMenu2_boxPosition == "topright") { window_pageX += PopUpMenu2_offsetx;
window_pageY += PopUpMenu2_offsety-PopUpMenu2_inheight; } else if (PopUpMenu2_boxPosition == "topleft") { window_pageX
-= (PopUpMenu2_offsetx+2)+PopUpMenu2_inwidth; window_pageY += PopUpMenu2_offsety-PopUpMenu2_inheight; } } else { if
( PopUpMenu2_browserWidth+PopUpMenu2_ScrOffX-PopUpMenu2_scrollbaroff < window_pageX+(PopUpMenu2_inwidth/2) )
{ window_pageX = PopUpMenu2_browserWidth+PopUpMenu2_ScrOffX-PopUpMenu2_inwidth-PopUpMenu2_scrollbaroff; } else if
( window_pageX-PopUpMenu2_ScrOffX-PopUpMenu2_inwidth/2 < 0 ) { window_pageX = PopUpMenu2_ScrOffX +
PopUpMenu2_scrollbaroff; } else { window_pageX -= Math.round(PopUpMenu2_inwidth/2); } if
( PopUpMenu2_browserHeight+PopUpMenu2_ScrOffY-PopUpMenu2_scrollbaroff < window_pageY+PopUpMenu2_inheight/2 )
{ window_pageY = PopUpMenu2_browserHeight+PopUpMenu2_ScrOffY-PopUpMenu2_inheight-PopUpMenu2_scrollbaroff; } else
if ( window_pageY-PopUpMenu2_ScrOffY-PopUpMenu2_inheight/2 < 0 ) { window_pageY = PopUpMenu2_ScrOffY +
PopUpMenu2_scrollbaroff; } else { window_pageY -= Math.round(PopUpMenu2_inheight/2); } } PopUpMenu2_viewIt(); } function
PopUpMenu2_viewIt() { PopUpMenu2_theobj.style.left=window_pageX + "px"; PopUpMenu2_theobj.style.top=window_pageY +
"px"; PopUpMenu2_theobj.style.width=PopUpMenu2_inwidth + "px";; PopUpMenu2_theobj.style.height=PopUpMenu2_inheight
+"px";; // PopUpMenu2_theobj.display="block"; PopUpMenu2_theobj.style.visibility="visible"; if (PopUpMenu2_ie55) { IfrRef =
document.getElementById('PopUpMenuIEFrame'); if (!IfrRef) return; IfrRef.style.width = PopUpMenu2_inwidth; IfrRef.style.height =
PopUpMenu2_inheight; IfrRef.style.top = window_pageY; IfrRef.style.left = window_pageX; IfrRef.style.zIndex =
PopUpMenu2_theobj.style.zIndex - 1; IfrRef.style.display = "block"; } } function PopUpMenu2_Stop(PopUpMenu2_Stop_now) { if (!
PopUpMenu2_Stop_now) { if (!PopUpMenu2_first_time) { return; } } else { PopUpMenu2_doNOThide=false; } if
(PopUpMenu2_iens6 && !PopUpMenu2_doNOThide) { if (PopUpMenu2_ie55 && IfrRef) { IfrRef.style.display = "none"; }
PopUpMenu2_theobj.style.visibility="hidden"; // PopUpMenu2_theobj.display="none"; PopUpMenu2_theobj.innerHTML = ""; if (!
PopUpMenu2_safari) { PopUpMenu2_theobj.style.width=1 + "px"; PopUpMenu2_theobj.style.height=1 + "px"; }
PopUpMenu2_doNOThide=false; PopUpMenu2_Stop_now=false; } function PopUpMenu2_Table_Cell_MouseOver( tableCellRef,
hoverFlag, navStyle , event_color ) { var Table_Cell_MouseOver_color_tmp = ""; var Table_Cell_MouseOut_color_tmp = ""; if
( hoverFlag ) { if (event_color) { Table_Cell_MouseOver_color_tmp = event_color; } else { try { if ( eval
('Table_Cell_MouseOver_color.'+navStyle) != undefined ) { Table_Cell_MouseOver_color_tmp = eval
('Table_Cell_MouseOver_color.'+navStyle); } else { Table_Cell_MouseOver_color_tmp = Table_Cell_MouseOver_color.def; } }
catch(exception) { } } if (Table_Cell_MouseOver_color_tmp) { Table_Cell_MouseOut_color_self_style =
tableCellRef.style.backgroundColor; tableCellRef.style.backgroundColor = Table_Cell_MouseOver_color_tmp; } // if
( document.getElementsByTagName ) { // tableCellRef.getElementsByTagName( 'a' )[0].style.color = '#F0F8FF'; // } } else { if
(event_color) { Table_Cell_MouseOut_color_tmp = event_color; } else { if (Table_Cell_MouseOut_color_self_style)
{ tableCellRef.style.backgroundColor = Table_Cell_MouseOut_color_self_style; } try { if ( eval
('Table_Cell_MouseOut_color.'+navStyle) != "undefined" ) { Table_Cell_MouseOut_color_tmp = eval
('Table_Cell_MouseOut_color.'+navStyle); } else { Table_Cell_MouseOut_color_tmp = Table_Cell_MouseOut_color.def; } } catch
(exception) { } } if (Table_Cell_MouseOut_color_tmp) { tableCellRef.style.backgroundColor =
Table_Cell_MouseOut_color_tmp; } } } /** * Returns the current width of the viewport. * @method getViewPortWidth * @return
{Int} The width of the viewable area of the page (excludes scrollbars). */ getViewPortWidth = function() { var width =
self.innerWidth; // Safari var mode = document.compatMode; if (mode) { // IE, Gecko, Opera width = (mode == 'CSS1Compat' ) ?
document.documentElement.clientWidth : // Standards document.body.clientWidth; // Quirks } return width; } /** * Returns the
current height of the viewport. * @method getViewPortHeight * @return {Int} The height of the viewable area of the page (excludes
scrollbars). */ getViewPortHeight = function() { var height = self.innerHeight; // Safari, Opera var mode = document.compatMode; if
( mode && !PopUpMenu2_opera ) { // IE, Gecko height = (mode == 'CSS1Compat' ) ? document.documentElement.clientHeight : //
Standards document.body.clientHeight; // Quirks } return height; }

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