The cardiac cycle

-Each cardiac cycle is formed of systole انقباض and diastole ارتخاء

-Duration of each cardiac cycle will be 0,8 sec0,8 يعني ضربه القلب الواحده بتستغرق ثانيه فا لو هيعمل 75ضربه هتستغرق 60 ثانيه

	time of systole	time of diastole
Artia	0,1sec	0,7sec
ventricle	0,3sec	0,5sec

-sequence of events during cardiac cycle:

1-the atrial systole (late diastole) duration 0,1sec:-

•SAN generates impulse(excitatory wave) which spreads over both atria,which excitate both atria followed by contraction of both atria

•the excitatory wave can't spread over the both ventricles due to the delay in AVN

يعني الاشارة الكهربية بتطلع من SAN تعمل اثاره إلي both atria.فا تتسبب في انقباض ال both atria, فا الاثاره دي مش هتنتقل إلى both ventricles عن طريق AVN في نفس الوقت عشان كده هتخلي ال ventricles و atria بنقبضو مع بعض عشان كدا يوجد ال AVN بتأخر استقبال الإثارة لحد ما انقباض ال atria يخلص

• 70% of the blood in atria pass to ventricles by pressure gradient (passively)30% of the blood in atria pass to ventricles by atrial contraction

يعنى 70%من الدم بتنقل من ال atria الي ventricles عن طريق pressure gradient عشان تركيز الدم عالي في ال atria طبيعي هينتقل الي ventricles بس في 30% من الدم بقى محتاج ال atria يعمل انقباض عشان ينزلهم (كان بيعصر نفسه)

•because of passage of blood from atria to ventricles, ventricles volume increase gradually and reaches a limit, this limit is (end-diastolic volume) it about 130 ml

يعني ال ventricles حجمه بيزيد لحد ما ال atria تفضي كل الدم فيه فا الحجم دا اسمه end -diastolic volume l

•increase in the atrial pressure due to contraction

•slightly increase in ventricular pressure but still less than atria pressure due to relaxation state in ventricles

•aortic,pulmonary pressure decreases because of the closed valves

عشان الدم بيروح لاطراف الجسم بس مفيش دم بيدخل من ناحية القلب

•Mitral and tricuspid valve opened

•4th heart sound can't be heard by the normal stethoscope سماعة الطبيب, this 4th heart sound is due to atrial contraction and ejection of blood

2-isometric or isovolumetric contraction phase,Duration 0,05:-

•The excitatory wave is transmitted by AVN to both ventricles

•first:, the tricuspid valve, mitral valves close, because the ventricular pressure exceeds atrial pressure,closing of these valves produces first heart sound, they also prevent return to atria

•Aortic and pulmonary valves close, so ventricles continue contraction in closed chamber, and aortic and pulmonary pressure decrease

•the ventricles pressure increased rapidly (from 0- to 80 mmhg) because of contraction of ventricles in closed chamber

•atrial pressure slightly increased due to blood in ventricles pushing the tricuspid, mitral valves upward (C Wave)

يعني ال tricuspid and mitral valves لما بيقفلو. و الانقباض شغال في ال ventricles بيدفع blood لفوق فا دا هو الي بيسبب زياده الضغط

•because of contraction of ventricles in closed chamber, the volume of ventricles is constant

3-maximum Ejection phase:durations 0,15 sec:-

•in this phase the ventricular pressure increases due to ventricular systole

•when the ventricular pressure exceeds the aortic and pulmonary pressure the valves will open

يعني الضغط في ال ventricles بيزيد نتيجه الانقباض والضغط في ال pulmonary و aortic بيقل فا لما الضغط بتاع ال ventricles يزيد عن ال aortic و ال pulmonary بيفتح ال valves

•the volume of ventricles decreases

عشان بيفضي الدم في ال aorta و ال pulmonary

•the aortic and pulmonary pressures increase so this phase called Rapid ejection phase

عشان خلاص بقا ال valves اتفتحت فا دخلهم دم كتير فا الصغط فيهم بيزيد

•mitral and tricuspid valves are still closed

•the atrial pressure decreases at beginning of this phase,then increase to accommodate the venous return

•always ventricles pressure is higher than Aortic and pulmonary pressure to prevent returning blood to ventricles

لازم طول الفترة دي ضغط الدم في البطين يكون اعلى منه في الشرايين

4-the reduced ejection phase

•during this phase less blood will be ejected from ventricles, the volume of ventricles and pressure will decrease gradually

مش الدم خلاص طلع بسرعه جداً في Rapid ejection phase بيتبقي شويه دم بقا بيطلعو ببطء في ال reduced ejection phase عشان كدا بيكون الضغط و حجم ال ventricles بيقل

•Aortic and pulmonary pressure start to decrease because blood coming to them is less than blood leaving them

مش احنا اتفقنا ان الدم في المرحله دي بيطلع ببطء و بتكون كميه قليله !؟ فا عشان كدا •Aortic and pulmonary pressure start to decrease

**دلوقت المرحله دي خلاص يعتبر ال ventricular systole بيخلص. في شويه دم بيكونو لسا موجودين في ال Ventricles مطلعوش دول اسمهم end -systolic volume =60ml

**طب فاكرين ال end diastolic volume الي كان عباره عن حجم ال ventricles وهو مليان بالدم 130ml

-كدا لو عايز اجيب حجم الدم الي القلب بيضخه في النبضه الواحده هيكون 130-60=70ml اسمهم ال stroke volume

•stroke volume is the amount of blood that are ejected by each ventricle per beat =70ml

•mitral and tricuspid valves still closed

•always ventricles pressure is higher than Aortic and pulmonary pressure to prevent returning blood to ventricles

5-protodiastolic phase:-

•the important event in this phase is the aortic and the pulmonary valves start to close to prevent return the blood from aortic and pulmonary arteries to ventricles

دلوقت الدم موجود في aortic and pulmonary arteries فا ال valves بتقفل عشان الدم ميرجعش ال ventricles فا الدم بيضغط علي ال valves فا بينتج عن الصغط دا diaprotic wave

•the ventricular pressure decrease and it’s volume increase

هنا بقا بداية الارتخاء فا عشان يستقبل الدم الي جاي من ال atria فا حجمه بيزيد و الضغط جوا بيقل

6-isovolumetric relaxation phase:-

•pulmonary and aortic valves are closed (responsible for 2nd hard sound in this phase) also the mitral and tricuspid valves are closed

•ventricles begin relaxation on closed chamber so the volume of ventricles is constant

•due to relaxation of ventricles in closed chamber that’s lead to sharp drop in ventricular pressure

•the atrial pressure increase due to venous return

•Aortic and pulmonary pressure decrease because their valves are closed this sharp drop called diacrotic notch, this is followed by diacrotic wave due to elastic recoil of aorta which increases the aortic pressure

7-the rapid filling phase:-

•Because of decrease in ventricular pressure and increase in atrial pressure,the atrial pressure will exceed the ventricular pressure which lead to opening mitral and tricuspid valves

•the blood will flow passively to ventricles because the atrial pressure is higher than ventricular pressure

•volume of the ventricles increased rapidly to accommodate the amount of atrial blood

•Aortic and pulmonary pressure decrease because their valves are closed

•this rapid filling responsible for third heart sound but it can't be heard

8-the reducing filling phase:-

•Mitral and tricuspid valves are still opened and blood continues to flow passively from atria to ventricles but with slower rate

•volume of ventricles increase gradually but pressure decreases

•Aortic and pulmonary pressure still decrease because valves still closed

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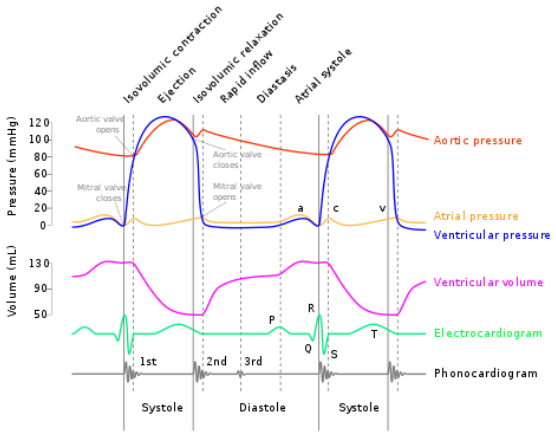


•Systolic pressure in:

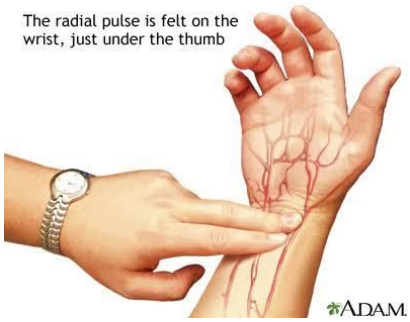
Aortic pressure is 120 mmhg

Pulmonary pressure is 25 mmhg

الضغط في ال pulmonary اقل ليه مع انهم بيضخوا نفس كميه الدم؟

عشان ال pulmonary arteries بتوصل الدم الي مسافه صغيره الي lung لكن ال aorta بيوصل الدم الي الجسم كله

*From the radial pulse wave we could know:-



- Heart rate/minute
- rhythm of heart,whether it regular or not
- force of contraction strong or weak due to hemorrhage or shook
- from palpation of radial pulses we could feel pulse not the wall of artery if we could cord like structure in arteriosclerosis

يعني احنا بنحس بالنبضه بس لكن مش بنحس بجدار الشريان دا في الحالة الطبيعية لكن في حالة التصلب الشرياني بنحس ب جدار الشريان

***كل الارقام الي في الملف مطالبين بيها