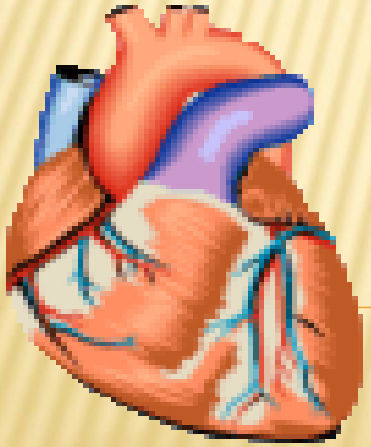
CARDIO-PULMONARY-CEREBRAL RESUSCITATION: PRACTICE IN CHINA



Xiaoxing Liao, MD. PhD.

Emergency Department

The First Affiliated Hospital of Sun Yat-Sen University

Guangzhou, China


China: Special Economic Zones
Special Economic Zone (SEZ)
Economic and Technical Development Zone
Key economic hub
0 200 400 600 Kilometers
0 200 400 600 Miles
Boundary representation is not necessarily authoritative.
Russia
Mongolia
Kazakhstan
Uzbekistan
Kyrgyzstan
Taj.
Pakistan
Line of control
Nepal
Bhu.
India
Bangl.
Burma
Bay of Bengal
Laos
Thailand
Vietnam
China
Harbin
Shenyang
North Korea
Sea of Japan
Demarcation Line
South Korea
Japan
Yellow Sea
East China Sea
South China Sea
Qinhuangdao
Beijing
Tianjin
Dalian
Yantai
Qingdao
Lianyungang
Nantong
Shanghai
Ningbo
Wenzhou
Fuzhou
Xiamen
Shantou
Guangzhou
Shenzhen
Zhuhai
Hong Kong
Macau (Port.)
Beihai
Zhanjiang
Hainan

- Guangzhou
- South of China
- The third big city in China
- About 13,000,000 population

Dr.Sun Yat-Sen (1866-1925)

Medical school, Sun Yat-Sen University


中山大學
附屬第一医院
THE FIRST AFFILIATED HOSPITAL SUN YAT-SEN UNIVERSITY


急诊
EMERGENCY
救护车
专用通道

EMERGENCY

CASE DATA

- Male, 28 years old, electric worker with good physical health
- On August 6, 2015 while working accidentally had electric shock experienced cardiac arrest and fell into the water
- Workers immediately rescued him , performed CPR on scene, gave mouth to mouth artificial respiration, informed “120”

CASE DATA

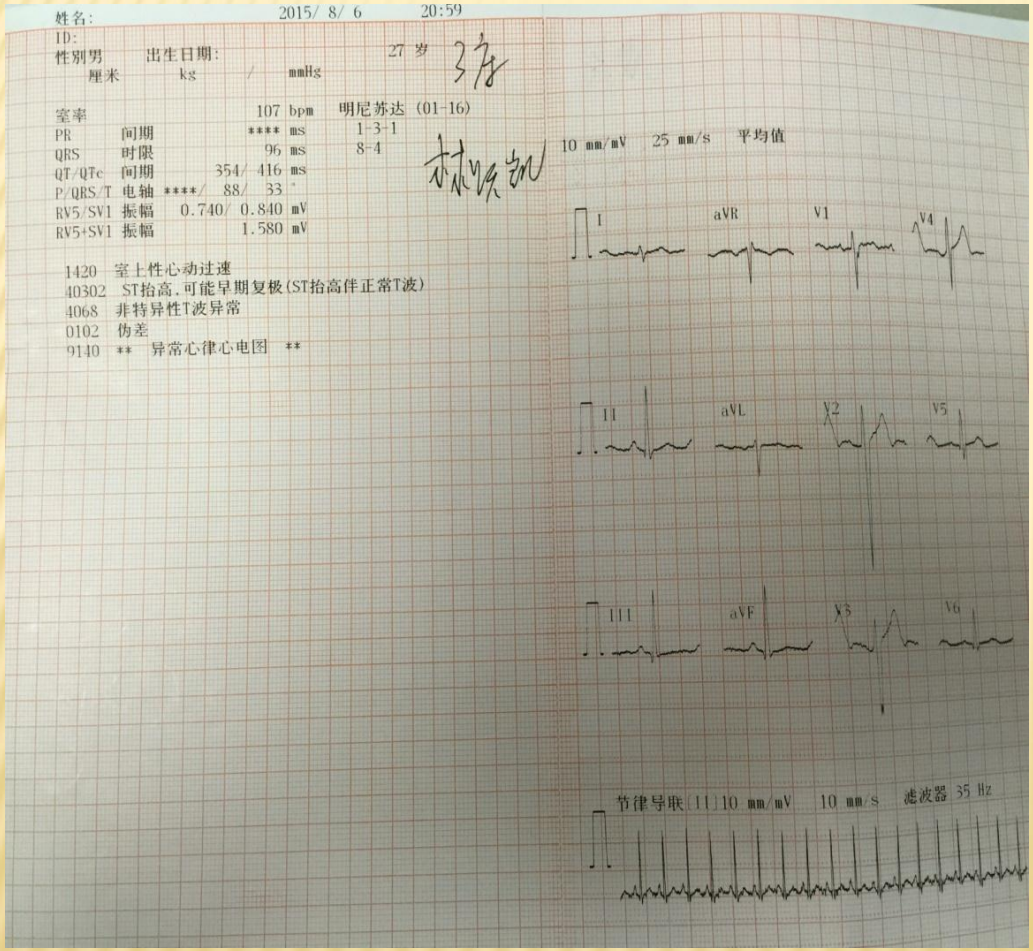
- Emergency personnel after arrival performed CPR, electric shock defibrillation, Noninvasive ventilator assisted ventilation, returned to the hospital to continue treatment

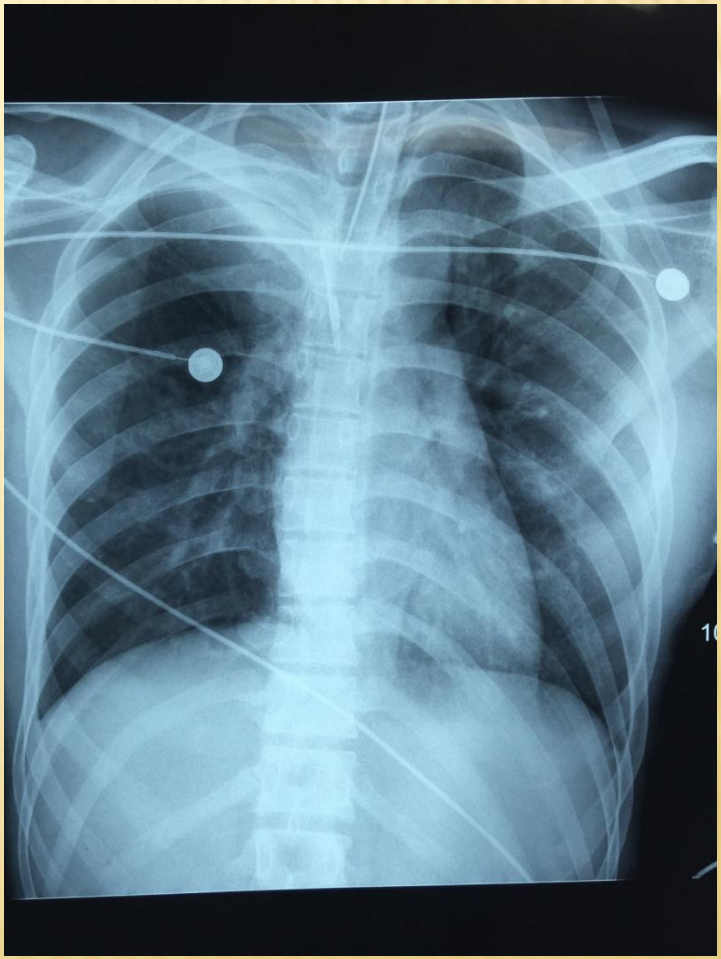
- After arrival in hospital, patient transferred to EICU for expert consultation

CASE DATA

CASE DATA

CASE DATA


姓名:
2015/ 8/ 6 20:59
ID:
性别男 出生日期:
27 岁
厘米 kg / mmHg
室率 107 bpm 明尼苏达 (01-16)
PR 间期 **** ms 1-3-1
QRS 时限 96 ms 8-4
QT/QTc 间期 354/ 416 ms
P/QRS/T 电轴 ****/ 88/ 33 °
RV5/SV1 振幅 0.740/ 0.840 mV
RV5+SV1 振幅 1.580 mV
1420 室上性心动过速
40302 ST抬高,可能早期复极(ST抬高伴正常T波)
4068 非特异性T波异常
0102 伪差
9140 ** 异常心律心电图 **
10 mm/mV 25 mm/s 平均值
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
节律导联 II 10 mm/mV 10 mm/s 滤波器 35 Hz



CASE DATA

CASE DATA

MAIN TREATMENT MEASURES (1)

- Vital signs
- Hemodynamic monitoring
- Maintain vital organ perfusion and maintain blood pressure
- Artificial ventilation to ensure oxygen supply

MAIN TREATMENT MEASURES (2)

- Maintain homeostasis
- High pressure oxygen
- External counter-pulsation
- Nerve rehabilitation
- Traditional Chinese Medicine

KEY LINK TO CPCR : CHEST COMPRESSIONS

THE MAIN PROBLEMS THAT EXIST AT PRESENT.

1. Poor quality chest compressions
2.Huge difference in survival rate
3.CPR not performed by the spectator

BASIC LIFE SUPPORT （BLS）

CHEST COMPRESSION

"Time is the best
interpretation of life"

Evolution From
A-B-C
to
C-A-B

BASIC LIFE SUPPORT(BLS)

HIGH QUALITY CPR

a) Push hard & Push fast
b) Rate 100-120/min
c) Compression depth at 5-6cm in adult
d) Allow complete chest recoil after each compression
e) Minimize interruptions in chest compressions
f) Avoid excessive ventilation

BASIC LIFE SUPPORT （BLS）

BASIC LIFE SUPPORT （BLS）

- 2010 International Recovery Guide pointed out that high quality chest compression is associated with high recovery rate
- 3 Elements to Improve the quality of the compression: fast enough, deep enough, uninterrupted
- New evidence suggests that the compression frequency which is significantly higher at about 120 beats per minute associated with better outcome

RELATIONSHIP BETWEEN CHEST COMPRESSION RATES AND OUTCOMES FROM CARDIAC ARREST

AHAMED H. IDRIS, MD; DANIELLE GUFFEY, BS; TOM P. AUFDERHEIDE, MD; SIOBHAN BROWN, PHD;

- **Background**—Guidelines for cardiopulmonary resuscitation recommend a chest compression rate of at least 100 compressions per minute. Animal and human studies have reported that blood flow is greatest with chest compression rates near 120/min, but few have reported rates used during out-of-hospital (OOH) cardiopulmonary resuscitation or the relationship between rate and outcome. The purpose of this study was to describe chest compression rates used by emergency medical services providers to resuscitate patients with OOH cardiac arrest and to determine the relationship between chest compression rate and outcome.

- **Methods and Results**—Included were patients aged ≥20 years with OOH cardiac arrest treated by emergency medical services providers participating in the Resuscitation Outcomes Consortium. Data were abstracted from monitor-defibrillator recordings during cardiopulmonary resuscitation. Multiple logistic regression analysis assessed the association between chest compression rate and outcome. From December 2005 to May 2007, 3098 patients with OOH cardiac arrest were included in this study. Mean age was 67±16 years, and 8.6% survived to hospital discharge. Mean compression rate was 112±19/min. A curvilinear association between chest compression rate and return of spontaneous circulation was found in cubic spline models after multivariable adjustment (P=0.012). Return of spontaneous circulation rates peaked at a compression rate of ≈125/min and then declined. Chest compression rate was not significantly associated with survival to hospital discharge in multivariable categorical or cubic spline models.

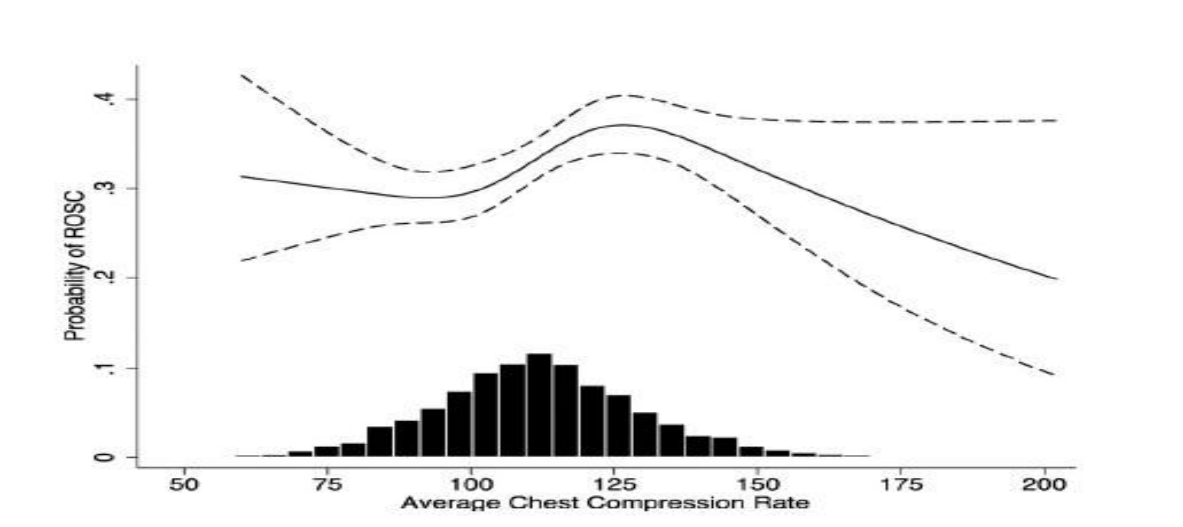
- **Conclusions**—Chest compression rate was associated with return of spontaneous circulation but not with survival to hospital discharge in OOH cardiac arrest.

- (Circulation. 2012;125:3004-3012.)

中山大學 附属第一医院
The First Affiliated Hospital, Sun Yat-sen University

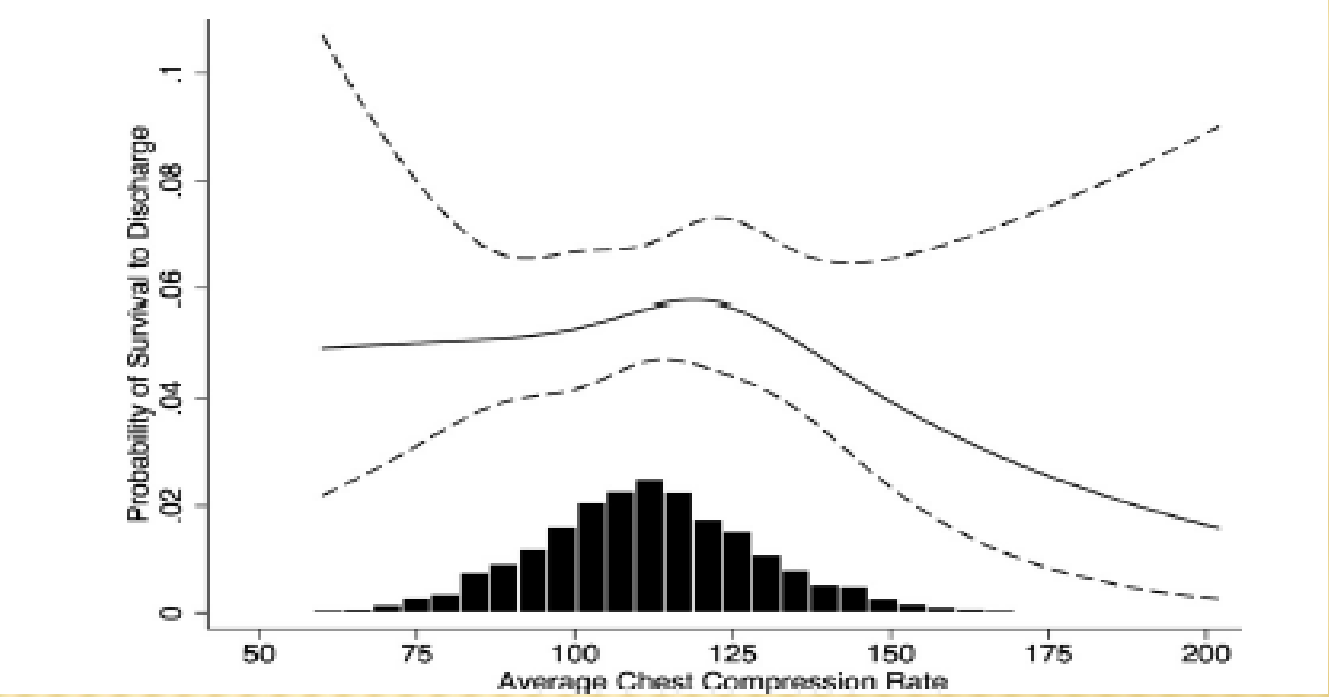
THE FREQUENCY AND DEPTH OF CHEST COMPRESSION

In a multicenter study conducted in North America, it was found that the recovery rate (ROSC) of the autonomous cycle reached a peak at about 125 times the time of pressing, and ROSC was decreasing if the pressing frequency was increased again. Reason: too fast frequency not only make the chest rebound, but also may reduce the depth of the press.



Ahamed H. Idris, et al. Relationship Between Chest Compression Rates and Outcomes From Cardiac Arrest. Circulation,2012.

THE FREQUENCY AND DEPTH OF CHEST COMPRESSION



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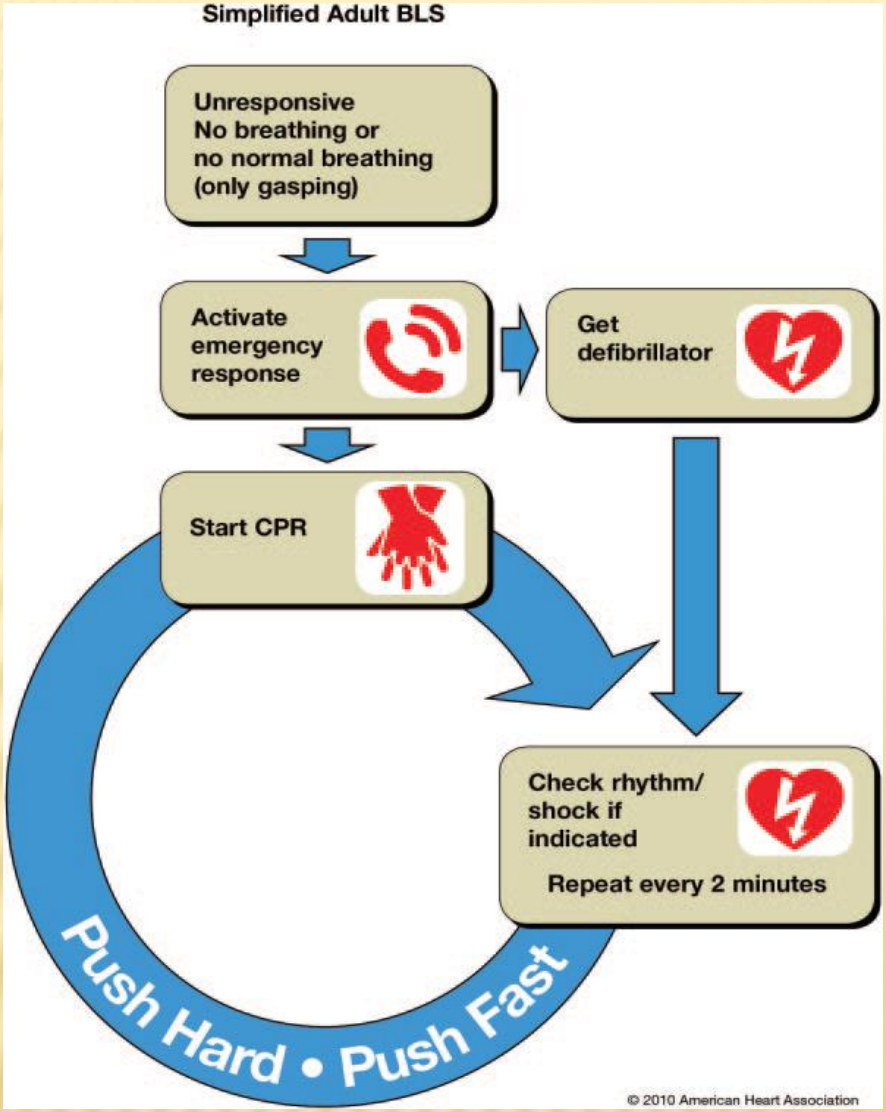

Simplified Adult BLS
Unresponsive
No breathing or
no normal breathing
(only gasping)
Activate
emergency
response
Get
defibrillator
Start CPR
Check rhythm/
shock if
indicated
Repeat every 2 minutes
Push Hard • Push Fast
© 2010 American Heart Association

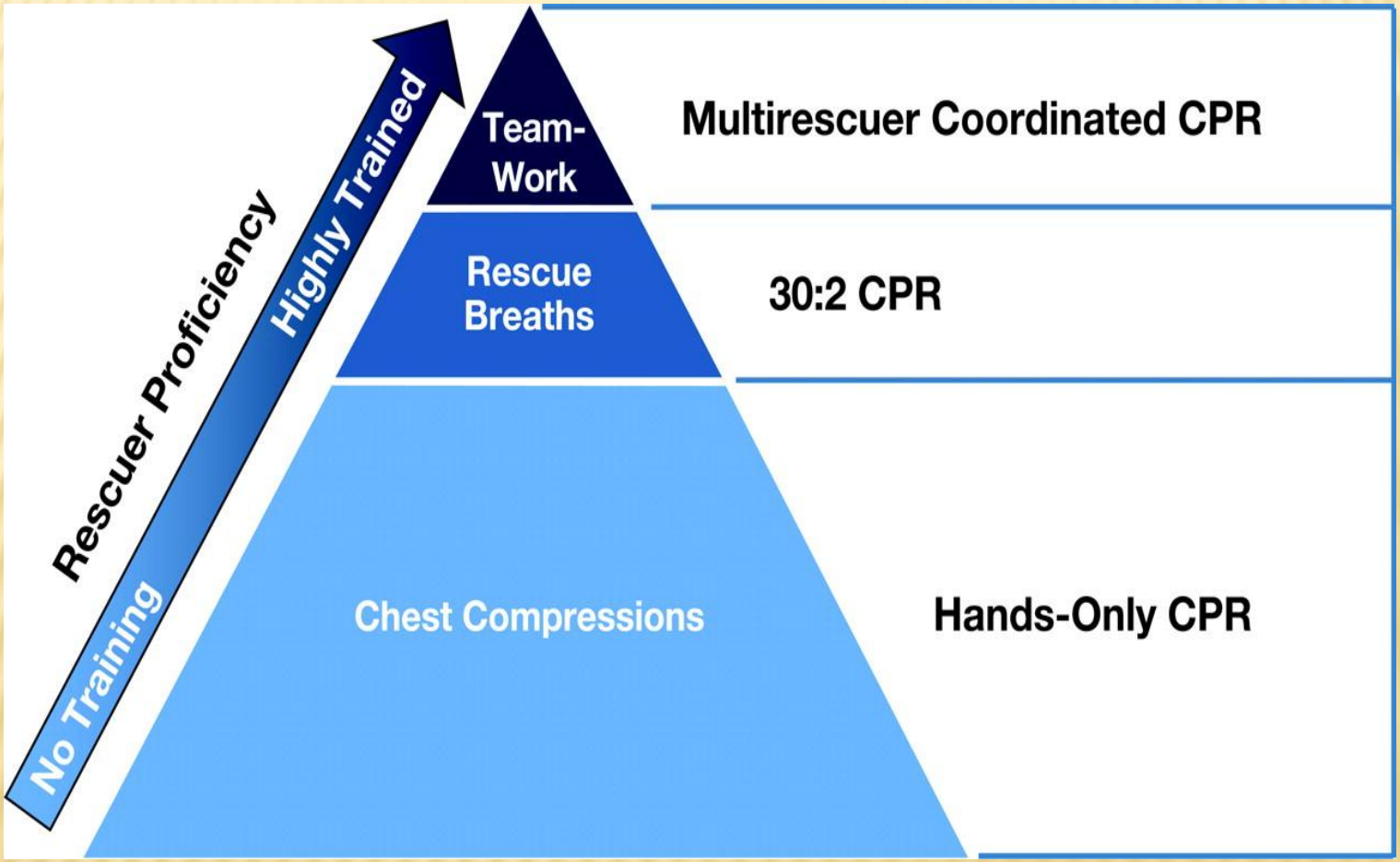
THE FREQUENCY AND DEPTH OF CHEST COMPRESSION

Fig. 5 Subcapsular hematoma of the liver (*square*) after CPR

Fig. 3 Rib fracture (*square*) after external CPR

HANDS-ONLY CPR

ADULT BLS SEQUENCE



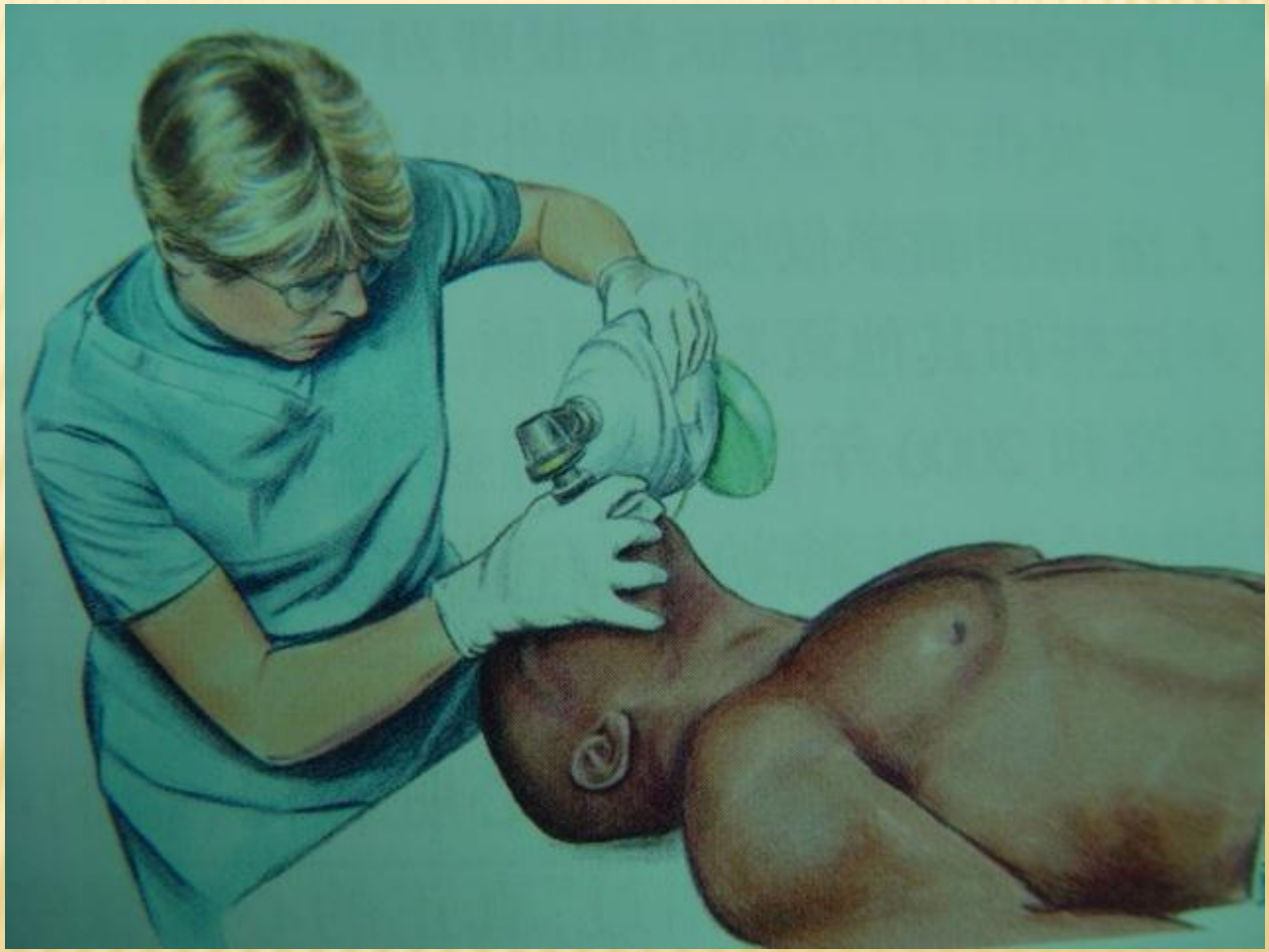
KEY LINK TO CPCR: ARTIFICIAL VENTILATION

ADVANCED CORONARY LIFE SUPPORT (ACLS)

- Advanced airway
- The important role of airway in cardiopulmonary resuscitation
- Under what circumstances use A-B-C?

  - Cardiac arrest caused by respiratory arrest , such as children with foreign body in respiratory tract, sputum blockage in elderly, drowning patients etc.

C-E APPROACH



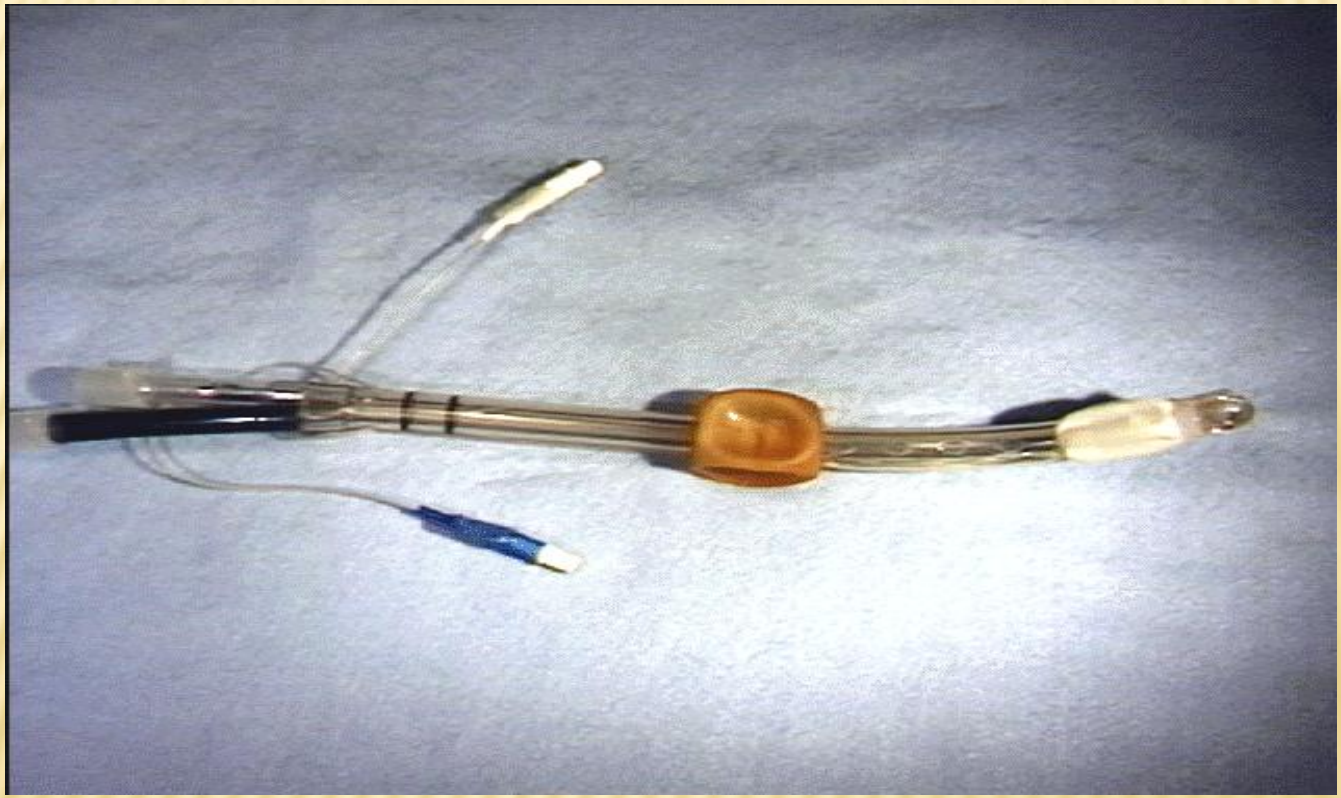
ENDOTRACHEAL INTUBATION

ARTIFICIAL AIRWAY

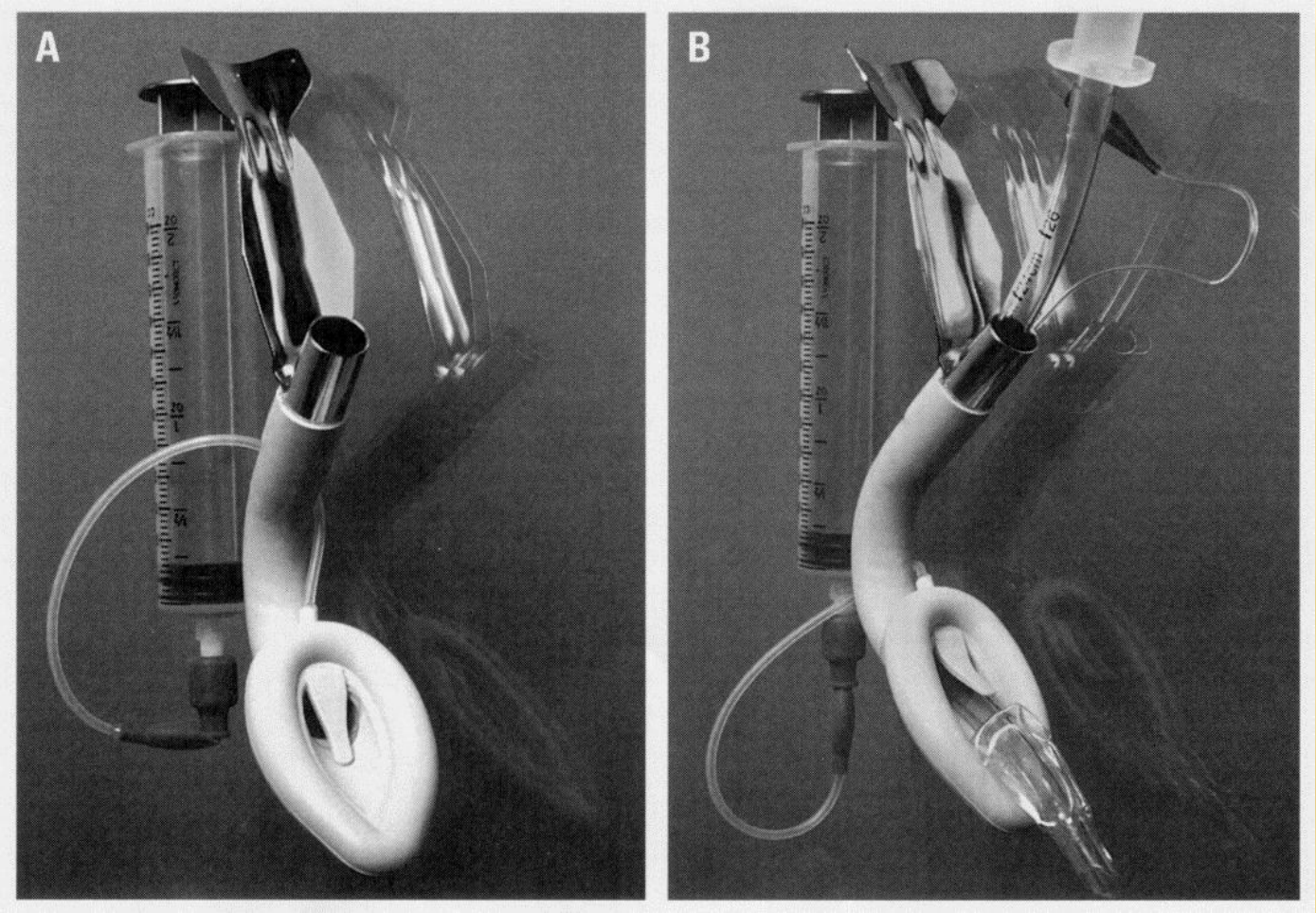
The choice of ventilation for patients with cardiac arrest should be determined on the basis of the following factors:

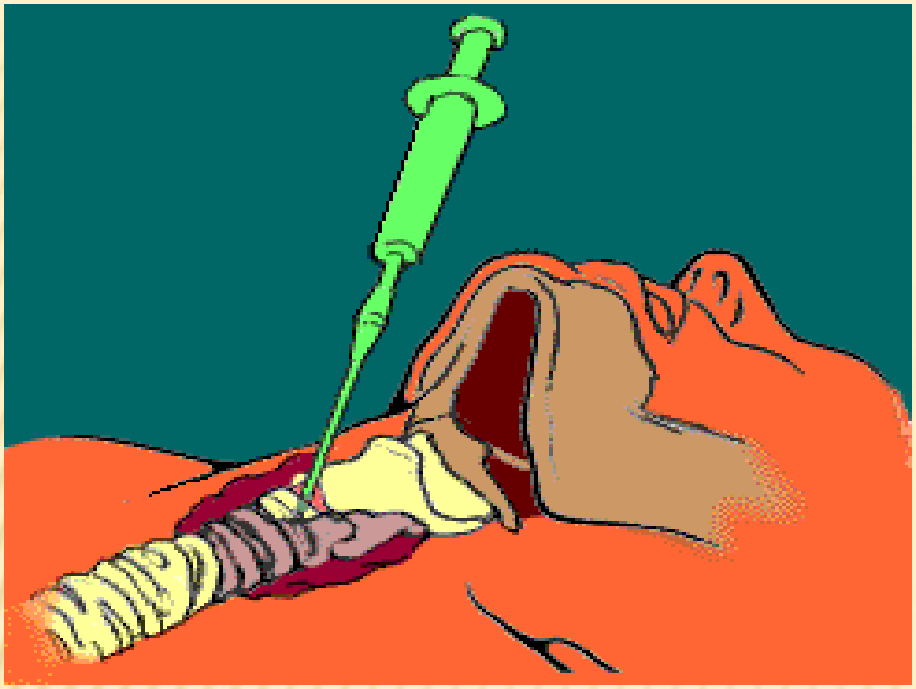
1. The patient's underlying cause
2. Whether the primary respiratory failure caused by cardiac arrest
3. Ability to rescue- staffs skill training
4. Available equipment on site and environmental conditions.
5. Whether it needs long distance transport

ESOPHAGUS-TRACHEAL CATHETER （ETC）



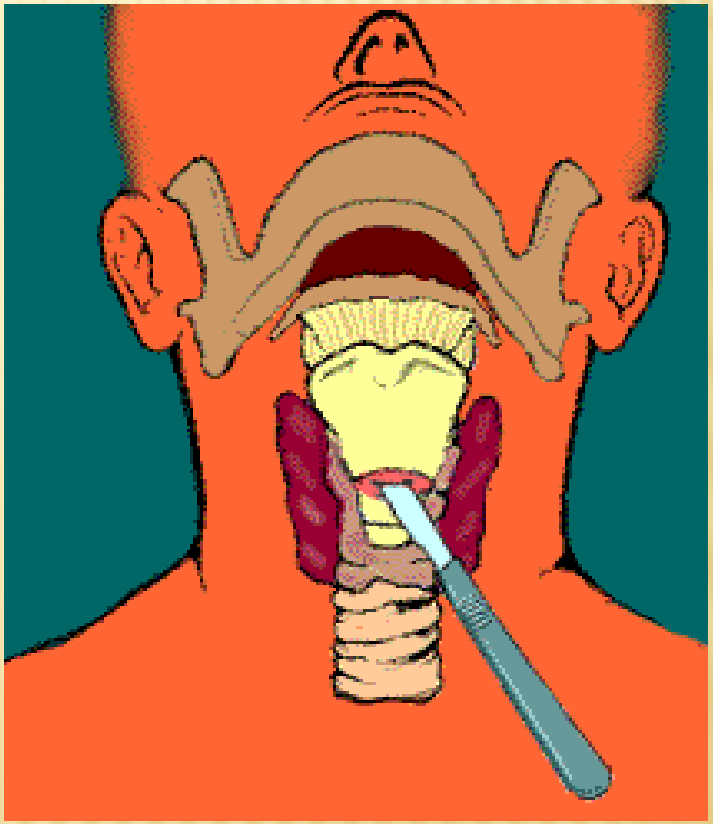
LMA (LARYNGEAL MASK AIRWAY)





intercricocentesis

intercricothyrotomy



KEY LINK TO CPCR: ELECTRIC SHOCK DEFIBRILLATION

BASIC LIFE SUPPORT （BLS）

- Defibrillation
- The proportion of ventricular fibrillation at the initial stage of sudden death
- Defibrillation time correlation
- From Single to bidirectional waves

SEMI-AUTOMATIC DEFIBRILLATOR

AUTOMATIC EXTERNAL DEFEBRILATION（AED）

- It is meant for the public use of life-saving tools, not medical staff dedicated "medical equipment"!

AUTOMATIC EXTERNAL DEFEBRILATION（AED）

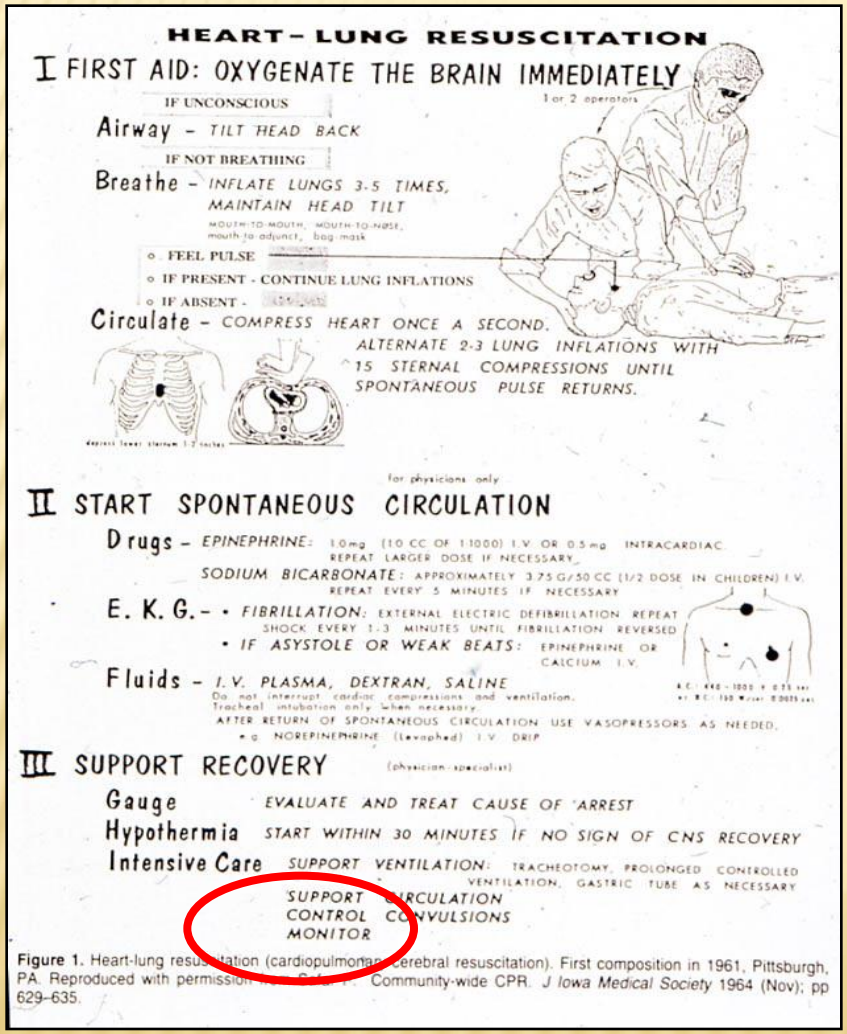
KEY LINK TO CPCR. THERAPEUTIC HYPOTHERMIA

THERAPEUTIC HYPOTHERMIA

- Treatment of brain function by therapeutic mild hypothermia.
- Reduce mortality
- Reduce the disability of the nervous system

- How to achieve sub-low temperature?

THERAPEUTIC HYPOTHERMIA



HEART–LUNG RESUSCITATION

I FIRST AID: OXYGENATE THE BRAIN IMMEDIATELY

IF UNCONSCIOUS

Airway – TILT HEAD BACK

IF NOT BREATHING

Breathe – INFLATE LUNGS 3-5 TIMES, MAINTAIN HEAD TILT

MOUTH-TO-MOUTH, MOUTH-TO-NOSE, mouth-to-adjunct, bag-mask

- FEEL PULSE
- IF PRESENT - CONTINUE LUNG INFLATIONS
- IF ABSENT -

Circulate – COMPRESS HEART ONCE A SECOND. ALTERNATE 2-3 LUNG INFLATIONS WITH 15 STERNAL COMPRESSIONS UNTIL SPONTANEOUS PULSE RETURNS.

II START SPONTANEOUS CIRCULATION

for physicians only

Drugs – EPINEPHRINE: 1.0 mg (10 CC OF 1:1000) I.V. OR 0.5 mg INTRACARDIAC. REPEAT LARGER DOSE IF NECESSARY.

SODIUM BICARBONATE: APPROXIMATELY 3.75 G/50 CC (1/2 DOSE IN CHILDREN) I.V. REPEAT EVERY 5 MINUTES IF NECESSARY

E. K. G. – • FIBRILLATION: EXTERNAL ELECTRIC DEFIBRILLATION. REPEAT SHOCK EVERY 1-3 MINUTES UNTIL FIBRILLATION REVERSED

• IF ASYSTOLE OR WEAK BEATS: EPINEPHRINE OR CALCIUM I.V.

Fluids – I.V. PLASMA, DEXTRAN, SALINE

Do not interrupt cardiac compressions and ventilation. Tracheal intubation only when necessary.

AFTER RETURN OF SPONTANEOUS CIRCULATION USE VASOPRESSORS AS NEEDED, e.g. NOREPINEPHRINE (Levophed) I.V. DRIP

III SUPPORT RECOVERY (physician-specialist)

Gauge – EVALUATE AND TREAT CAUSE OF ARREST

Hypothermia – START WITHIN 30 MINUTES IF NO SIGN OF CNS RECOVERY

Intensive Care – SUPPORT VENTILATION: TRACHEOTOMY, PROLONGED CONTROLLED VENTILATION, GASTRIC TUBE AS NECESSARY

SUPPORT CIRCULATION
CONTROL CONVULSIONS
MONITOR

Figure 1. Heart-lung resuscitation (cardiopulmonary cerebral resuscitation). First composition in 1961, Pittsburgh, PA. Reproduced with permission from Safar P. Community-wide CPR. *J Iowa Medical Society* 1964 (Nov); pp 629–635.

Dr.Peter Safar

中山大學 附屬第一医院
The First Affiliated Hospital, Sun Yat-sen University

THERAPEUTIC HYPOTHERMIA

2005 CPR/ECC 指南推动低温治疗的应用

American Heart Association®
Learn and Live℠

2005 American Heart Association(AHA) guidelines for cardiopulmonary resuscitation(CPR) and emergency cardiovascular care (ECC)

- Unconciuous adult patients with return of spontaneous circulation (ROSC) after out-of-hospital cardiac arrest should be cooled to 32℃ to 34℃ (89.6 to 93.2) for 12 to 24 hours when the initial rhythm was ventricular fibrillation (VF). *Class IIa*
- Similar therapy may be beneficial for patients with non-VF arrest out of hospital or for in-hospital arrest. *Class IIb*
- More recent studies AHA suggests that internal cooling techniques (eg, cold saline, endovascular cooling cather) can also be used to induce hypothermia. Providers should continuously monitor the patient's temperature during cooling.

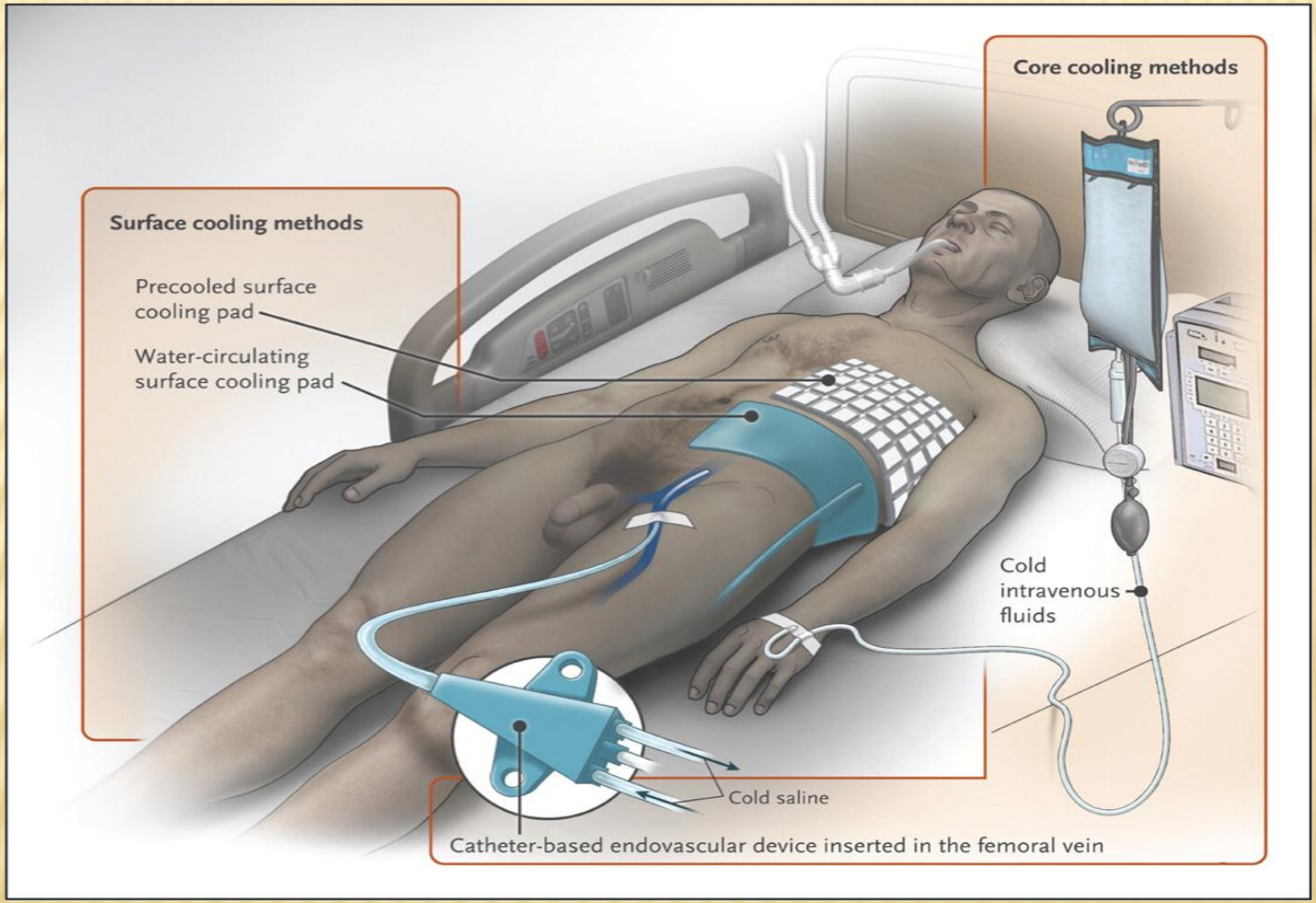
Published in Circulation. 2005;000:IV-84-IV-88.


KCI


(C)

THERAPEUTIC HYPOTHERMIA

THERAPEUTIC HYPOTHERMIA

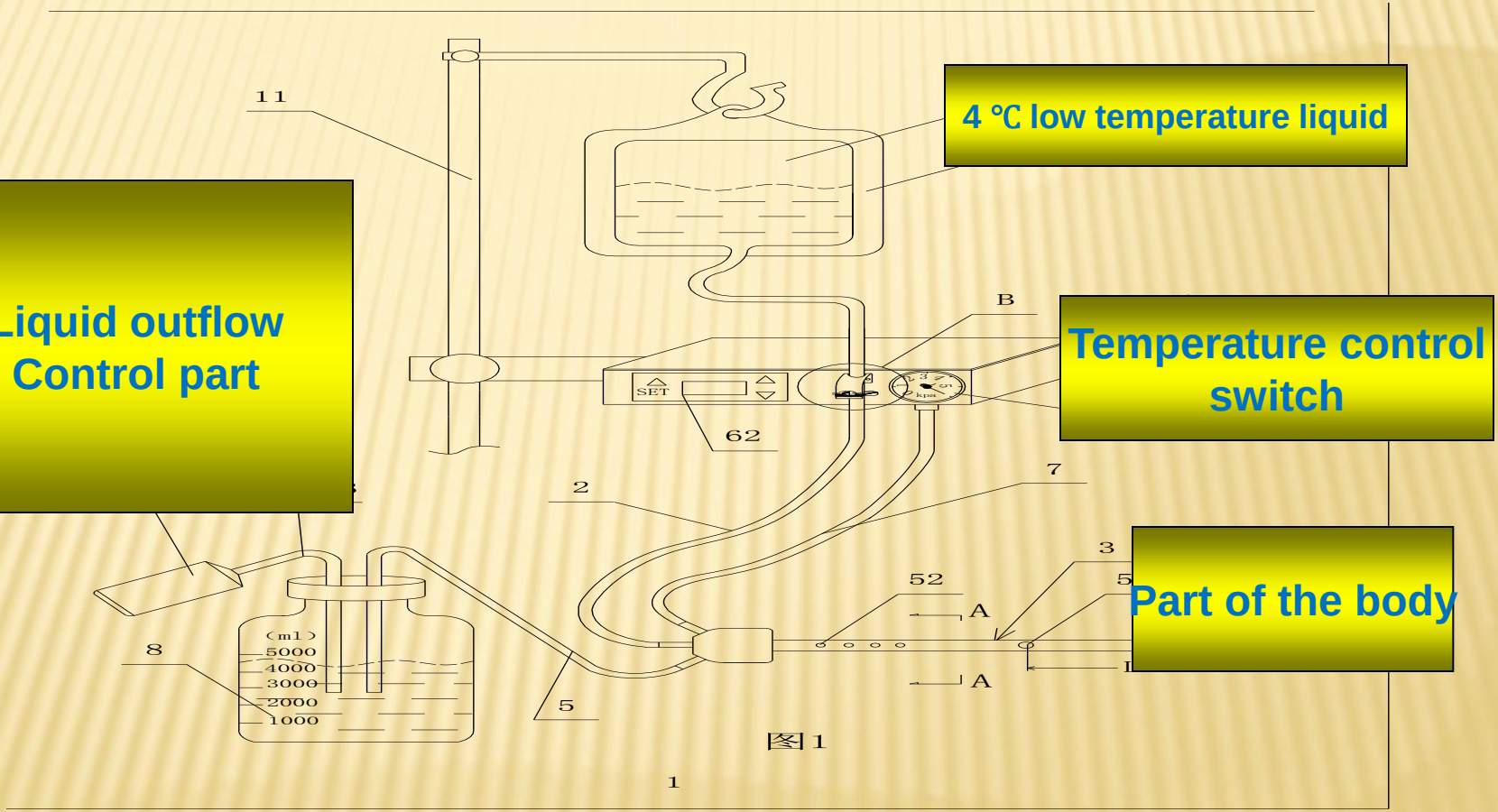


OUR RESEARCH: ABDOMINAL CAVITY COOLING METHOD

Purpose

- Intra-peritoneal perfusion of low temperature liquid can achieve induced sub-low temperature?
- To achieve sub-low temperature after the connection of homemade perfusion device can achieve the maintenance of sub-low temperature and slow re-temperature?
- Can it reduce brain damage?
- Mechanism ?

Cryogenic liquid perfusion device



4 ℃ low temperature liquid

Liquid outflow Control part

Temperature control switch

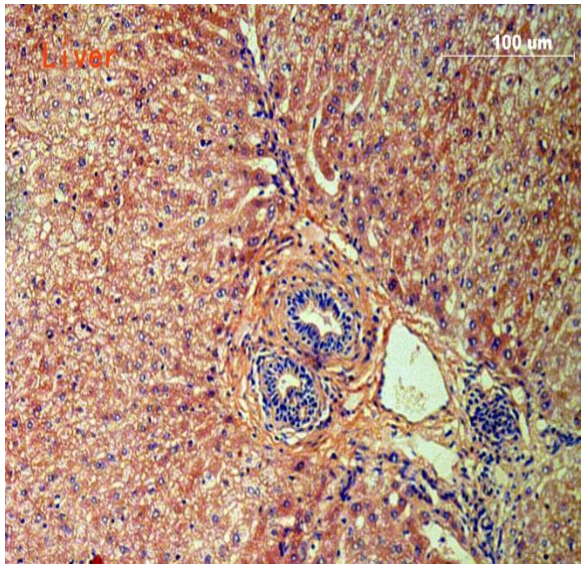
Part of the body

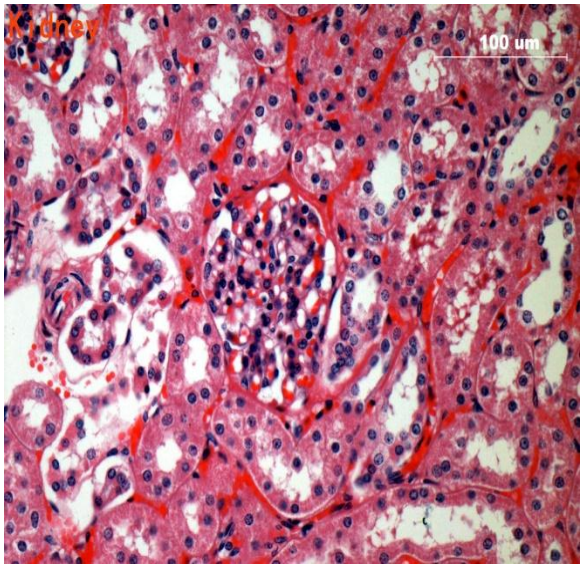
OUR RESEARCH: ABDOMINAL CAVITY COOLING METHOD

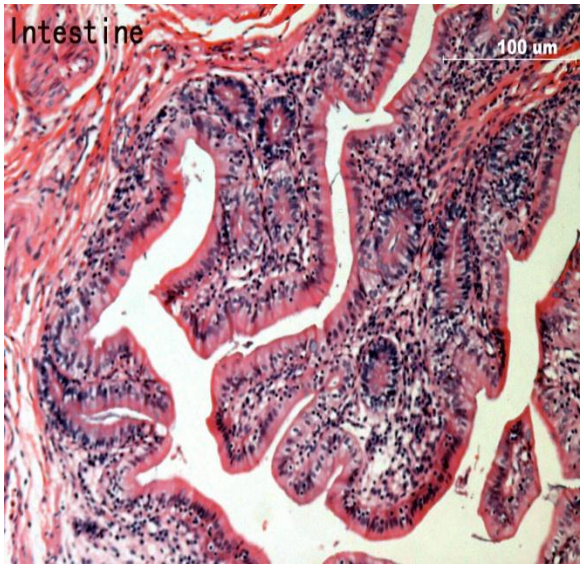




Effects of cryogenic liquid on liver, kidney and intestine and major abdominal organs







Intraperitoneal infusion of cryopreserved cells 24 hours after liver, kidney and ileum ileocecal tissue sections (HE staining): The organization structure without defect, cell morphology is completed, no inflammatory cell infiltration phenomenon

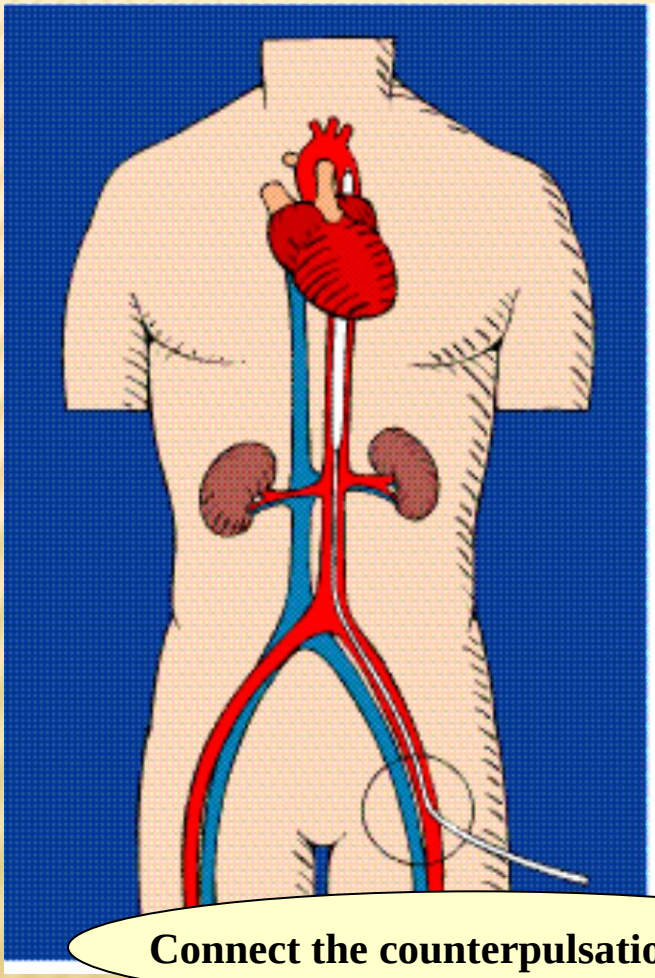
OUR RESEARCH: ABDOMINAL CAVITY COOLING METHOD

Conclusion

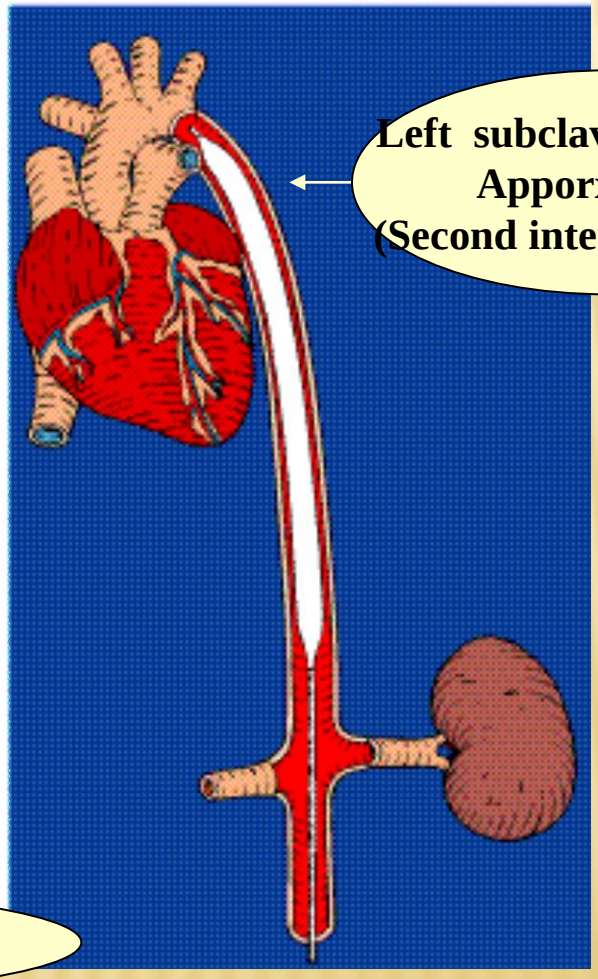
- Cardiopulmonary resuscitation after a new type of abdominal cooling method can quickly induce mild hypothermia
- Sub-peritoneal hypothermia can significantly reduce neuronal apoptosis after brain injury and other cooling method compared to have more advantages

KEY LINK TO CPCR: CIRCULATION SUPPORT

CIRCULATION SUPPORT -IABP



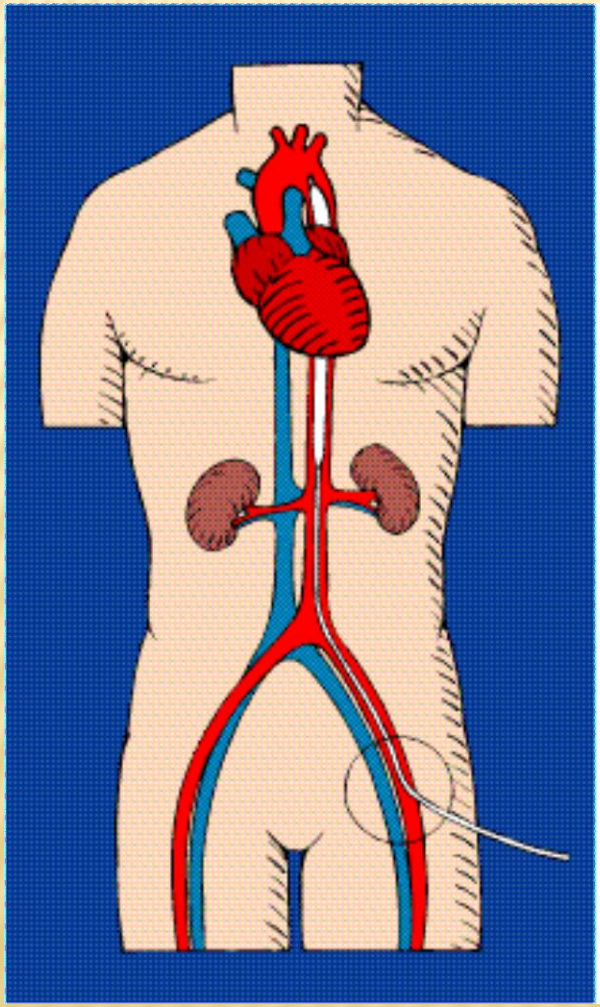
Connect the counterpulsation pump

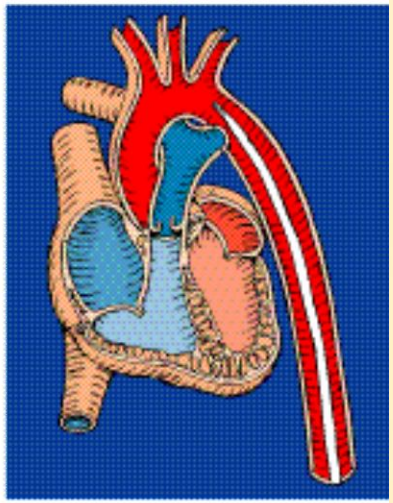


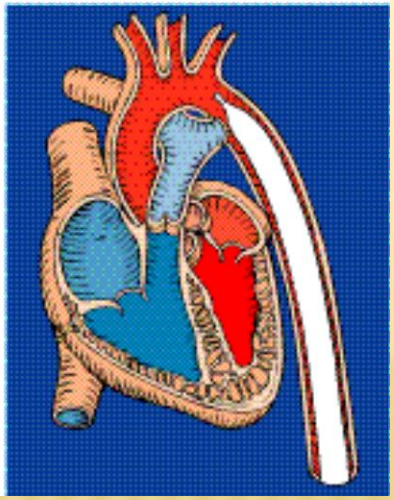
Left subclavicular artery
Apporx-2-3cm
(Second intercostal space)

kidney

THE PRINCIPLE OF IABP







•Before the heart systole (when the aorta is open), the balloon deflates, reduces the end-diastolic pressure in the aorta, reduces left ventricular work, reduces the after-load, reduces myocardial oxygen consumption.

.Before the diastole(aortic closure), balloon inflatable, increased diastolic coronary perfusion pressure, increased myocardial oxygen.

OUR RESEARCH: ENHANCED EXTERNAL COUNTER PULSATION（EECP）

- It is a special noninvasive mechanical auxiliary circulatory device, the use of mechanical effects to improve the aortic root diastolic blood pressure, reduce aortic systolic blood pressure, increase heart and brain blood flow, improve heart and brain metabolism, for cardiovascular and cerebro-vascular disease treatment

- Is it possible to treat cardiopulmonary resuscitation?

OUR RESEARCH-ENHANCED EXTERNAL COUNTER PULSATION （EECP）

OUR RESEARCH-ENHANCED EXTERNAL COUNTER PULSATION（EECP）

Conclusion (animal experiment)

- EECP has a therapeutic effect on brain injury after CPR
- Significant increase in carotid blood flow
- Significant improvement in brain tissue oxygen partial pressure
- Significant improvement in brain microcirculation

CARDIOPULMONARY RESUSCITATION TRAINING IN CHINA

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The First Affiliated Hospital, Sun Yat-sen University

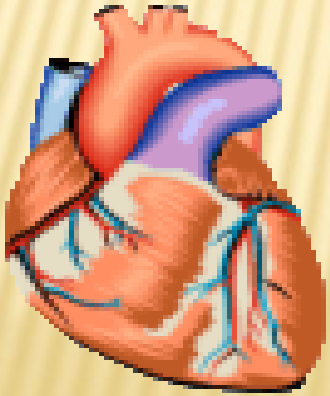
SUMMARY

- Modern cardiopulmonary resuscitation has been in clinical practice for more than 50 years, and a unified international cardiopulmonary resuscitation guide has also been implemented for over 15 years
- Although the success rate of cardiopulmonary resuscitation did not appear to have improved significantly from epidemiological and statistical perspectives, many of the research data included a variety of confounding factors such as cardiopulmonary resuscitation, primary cardiac arrest, But actually in clinical practice includes a variety of organic disease patients, or even dying state, thus affecting the objectivity of the conclusions

SUMMARY

- Since 2000, the use of a unified global cardiopulmonary resuscitation guide in the theoretical system and practical technology have a new breakthrough
- As a clinician, we also feel that the principles and methods recommended in accordance with the guidelines to successfully save the lives of many patients
- It is good at combining evidence and evidence in clinical practice and introducing new and useful new technologies to optimize recovery processes and improve early identification, assessment, diagnosis and treatment

THANKS FOR YOUR ATTENTION!



E-mail: liaowens@163.com
新浪微博：急救星哥

中山大學 附属第一医院
The First Affiliated Hospital, Sun Yat-sen University