



多器官功能障碍综合征

Multiple Organ Dysfunction Syndrome

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Historical perspective

Cellular and subcellular signaling, **2000-present**

SIRS/CARS, MODS, **1990's**

Sepsis, MOF , **1980's**

1970's, Organ support, MOF

Viet Nam War, ARDS

World War 2, reduced blood volume, renal failure

World War 1, Wound toxins, Cardiac failure



What lessons ?

- ❖ The common end points of those diseases, if treatment is untimely or inadequate, are injury to organs uninvolved in the initial process.
- ❖ MODS is not, by themselves, diseases. It is caused by various diseases, such as acute pancreatitis, burns, trauma, as well as severe infection.



Basic concepts

- ❖ SIRS: Systemic Inflammatory Response Syndrome
- ❖ Sepsis
- ❖ Severe sepsis
- ❖ Septic shock
- ❖ MODS: Multiple Organ Dysfunction Syndrome (old name: MOF)

Definitions

Proposed by ACCP & ASCCM in 1992

❖SIRS: Two or more of following criteria are met:

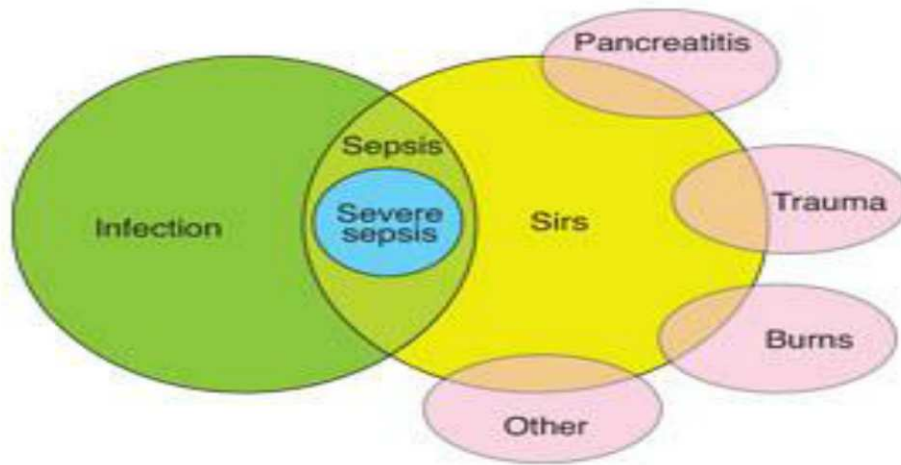
T > 38 or < 36; Heart rate > 90; WBC > $12 \times 10^9/L$ or < $4 \times 10^9/L$; Tachypnea: respiratory rate > 20;

❖Sepsis: SIRS with clinical or evidence of infection;

❖Severe sepsis: Sepsis with organ dysfunction;

❖Septic shock: Sepsis with arterial hypotension;

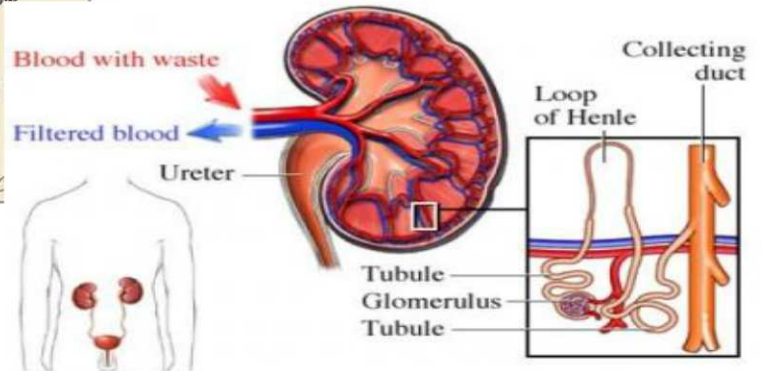
❖MODS: Progressive but reversible dysfunction of two or more organs; Leading cause of ICU death.



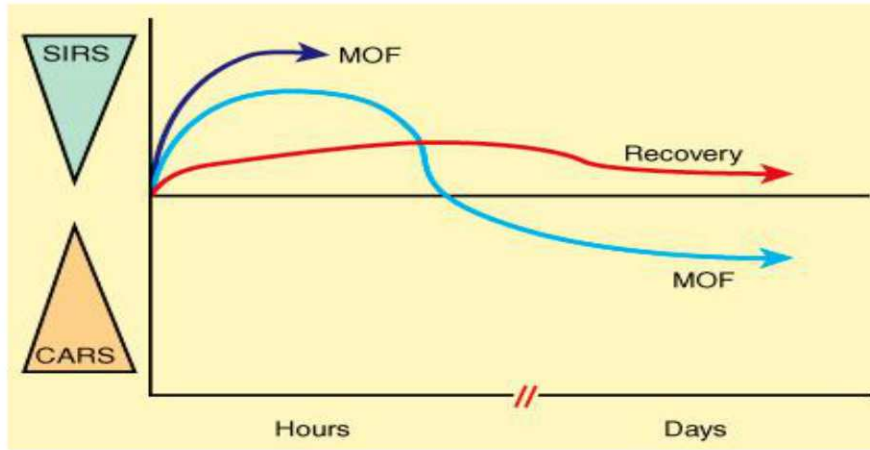
MODS is the end result of a normal physiologic response

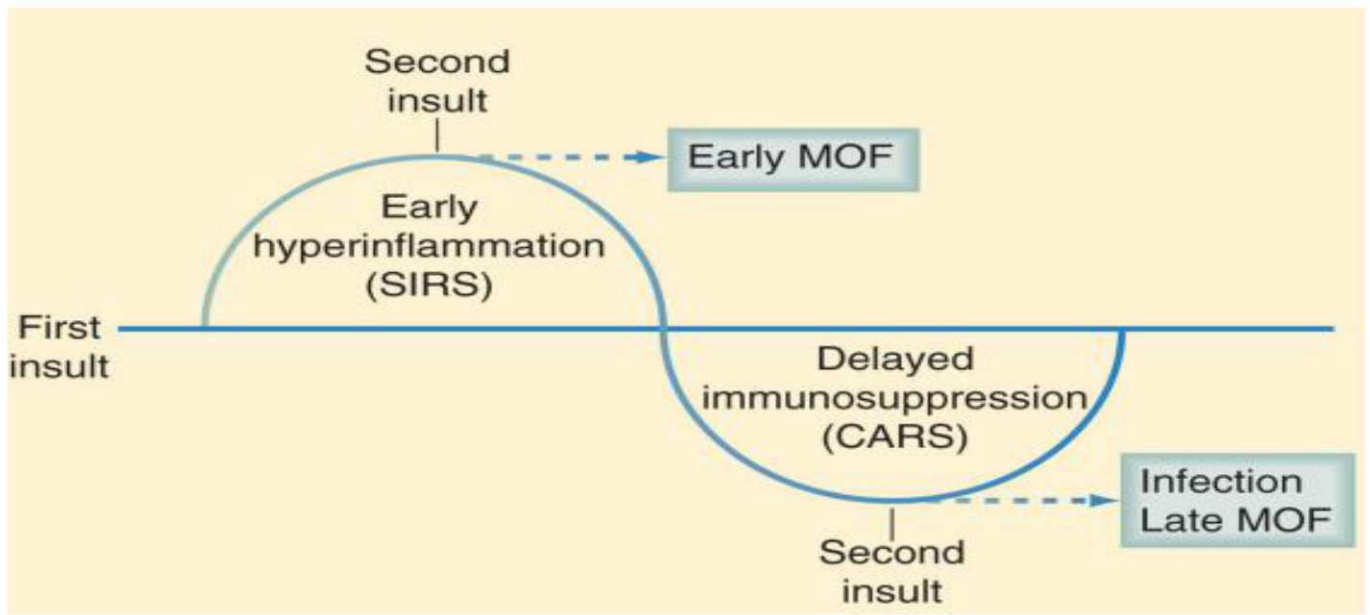
CAUSES OF ACUTE RENAL FAILURE

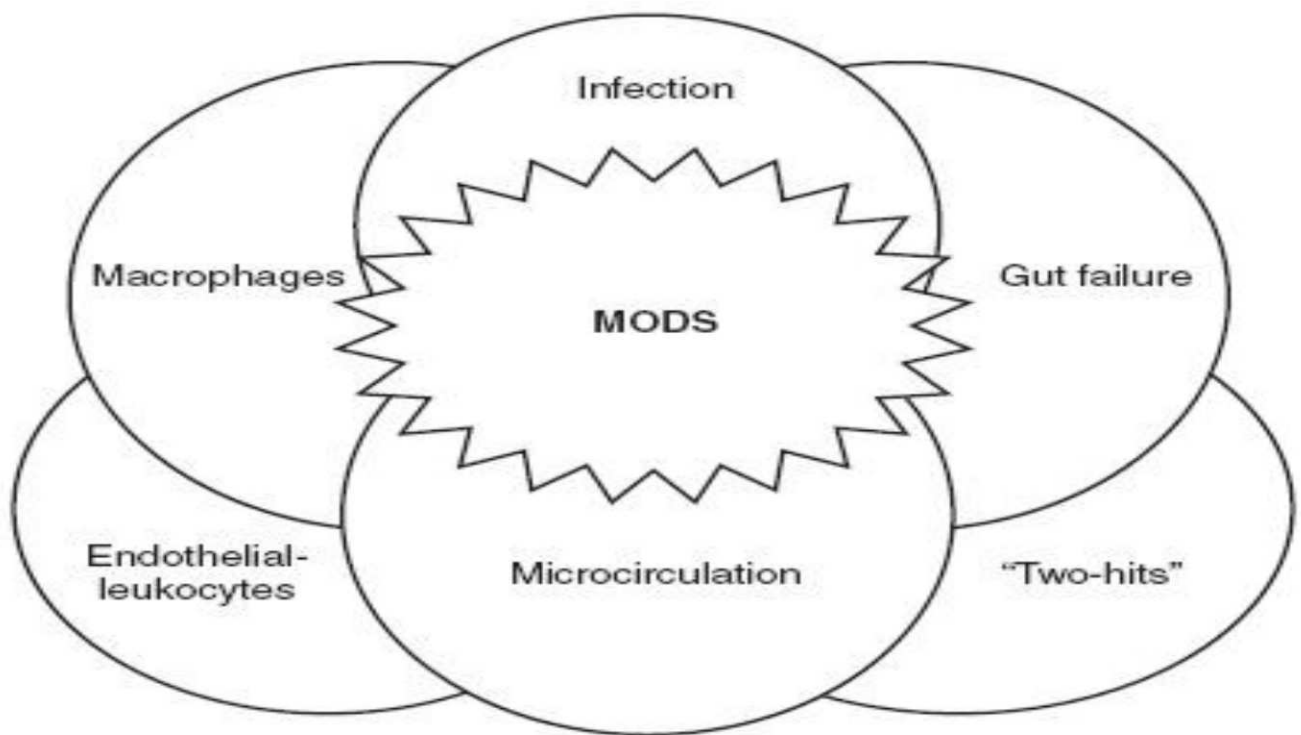
- 1 Prerenal**
Sudden and severe drop in blood pressure (shock) or interruption of blood flow to the kidneys from severe injury or illness
- 2 Intrarenal**
Direct damage to the kidneys by inflammation, toxins, drugs, infection, or reduced blood supply
- 3 Postrenal**
Sudden obstruction of urine flow due to enlarged prostate, kidney stones, bladder tumor, or injury



SIRS Vs CARS









Diagnostic criteria for significant organ dysfunction

Organ System	Criteria
Pulmonary	Need for mechanical ventilation; PaO ₂ :FiO ₂ ratio <300 mm Hg for 24 hr
Cardiovascular	Need for inotropic drugs to maintain adequate tissue perfusion or CI <2.5 L/min/m ²
Kidney	Creatinine >2 times baseline on 2 consecutive days or need for renal replacement therapy
Liver	Bilirubin >3 mg/dL on 2 consecutive days or PT >1.5 control
Nutrition	10% reduction in lean body mass, albumin <2.0 g/dL or total lymphocyte count <1,000/mm ³
CNS	Glasgow Coma Scale <10 without sedation
Coagulation	Platelet count <50,000/mm ³ ; fibrinogen <100 mg/dL or need for factor replacement
Host defenses	WBC <1,000/mm ³ or invasive infection including bacteremia

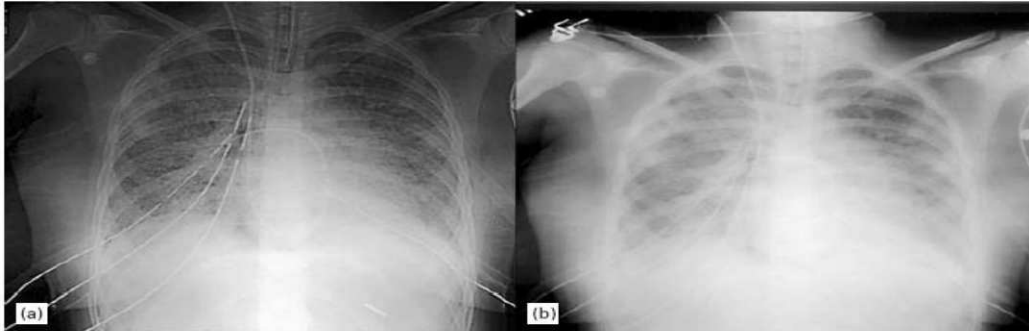
^aPao₂, partial pressure of oxygen in arterial blood; FiO₂, fraction of inspired oxygen; CI, cardiac index; PT, prothrombin time; WBC, white blood cell count.



Characteristics of MODS

- ❖ Any combination
- ❖ Respiratory, cardiovascular and renal dysfunction dominate clinical picture.
- ❖ Sequence: Lung – Gut/Liver – Kidney
- ❖ More organ dysfunction, More deadly
- ❖ Longer organ dysfunction, more deadly

ARDS



Chest radiographic findings in ARDS. (a) Note the bilateral patchy infiltrates necessary to make diagnosis of ARDS. (b) This CXR is of the same patient 12 h later. It emphasizes how rapidly such patients can deteriorate and helps illustrate why oxygenation can be extremely difficult.



Prevention of organ dysfunction

The only treatment for MODS is prevention.



Case report 1

❖ A 50-year-old male, admitted to the hospital because of abdominal pain for 12hrs. PE: P 110/min, Bp 100/60mmHg, R 20/min. Obvious tenderness and rebound tenderness on the whole abdomen. Lab finding: Amylase elevated.

❖ Diagnosis: AP

❖ Outcome:



Acute pancreatitis

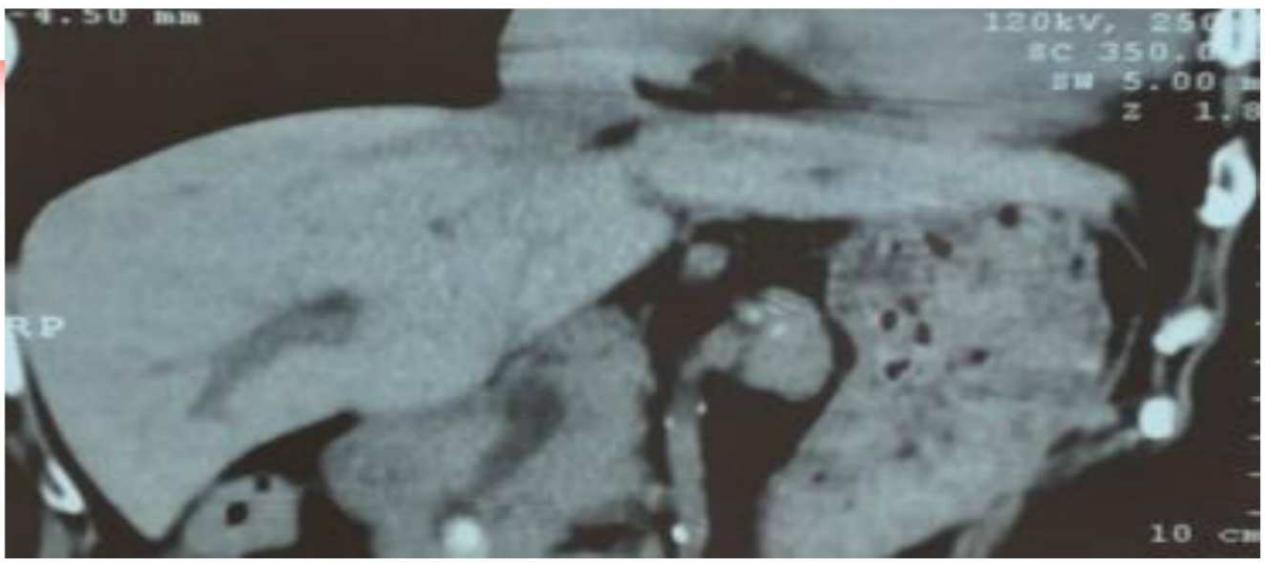




Case report 2

❖A 70-year-old female, admitted to our hospital because of abdominal pain, fever and jaundice for 3 days. PE: P 120/min, Bp 90/60mmHg, severe jaundice, tenderness and rebound tenderness on the right upper quadrant, Murphy sign is positive.

❖Diagnosis:







Case report 3

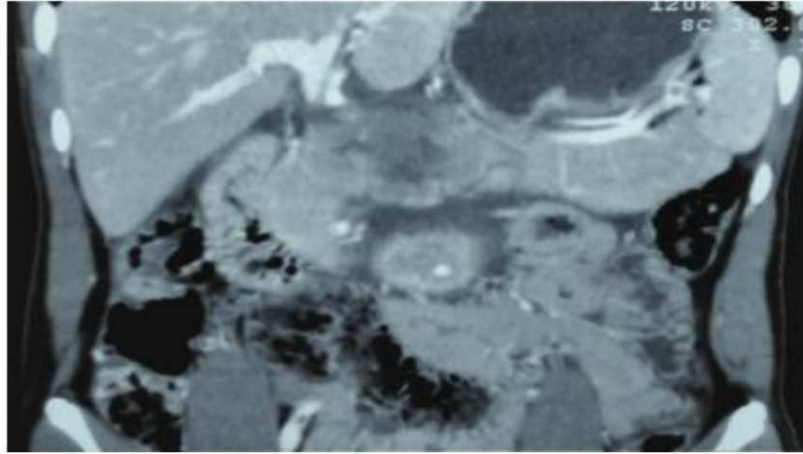
❖ A 53-year-old man, was admitted to the Emergency Department of our hospital because of abdominal pain for 4hrs. He had faint when he went to the bathroom. PE: P 120/min, Bp 60/40 mmHg, abdominal distention. He was sent to have a CT scan, which showed intestinal obstruction and ascites. I was called to visit the patient.





Case report 4

- ❖ A 16-year-old man, admitted to our hospital because of car accident 20 hours ago. He was treated in the local hospital and laparotomy was performed....
- ❖ Why was he transferred to our hospital?
- ❖ The final result?





Prevention of organ dysfunction

The only treatment for MODS is prevention.

1. Avoid ischemia: early aggressive resuscitation;
2. Control the underlying diseases;
3. Avoidance of second insult (damage control);
4. Pay attention to the risk factors for the development of MODS, including advanced age, malignancy, immunosuppression, diabetes, cirrhosis;



Management principles

- ❖ Treat diseases fueling MODS;
- ❖ Support defunctional organ system;
- ❖ Early intervention, at the first sign of dysfunction.

2 major advances in the last half century



1. Development of mechanical supports for failing mechanical systems: ventilator, ventricular assist device, and renal replacement therapy;
2. Development of organ transplantation.



References

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2. Fischer JE. Mastery of Surgery 5th ed
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4. 吴阶平，裘法祖。黄家驷外科学。第六版。