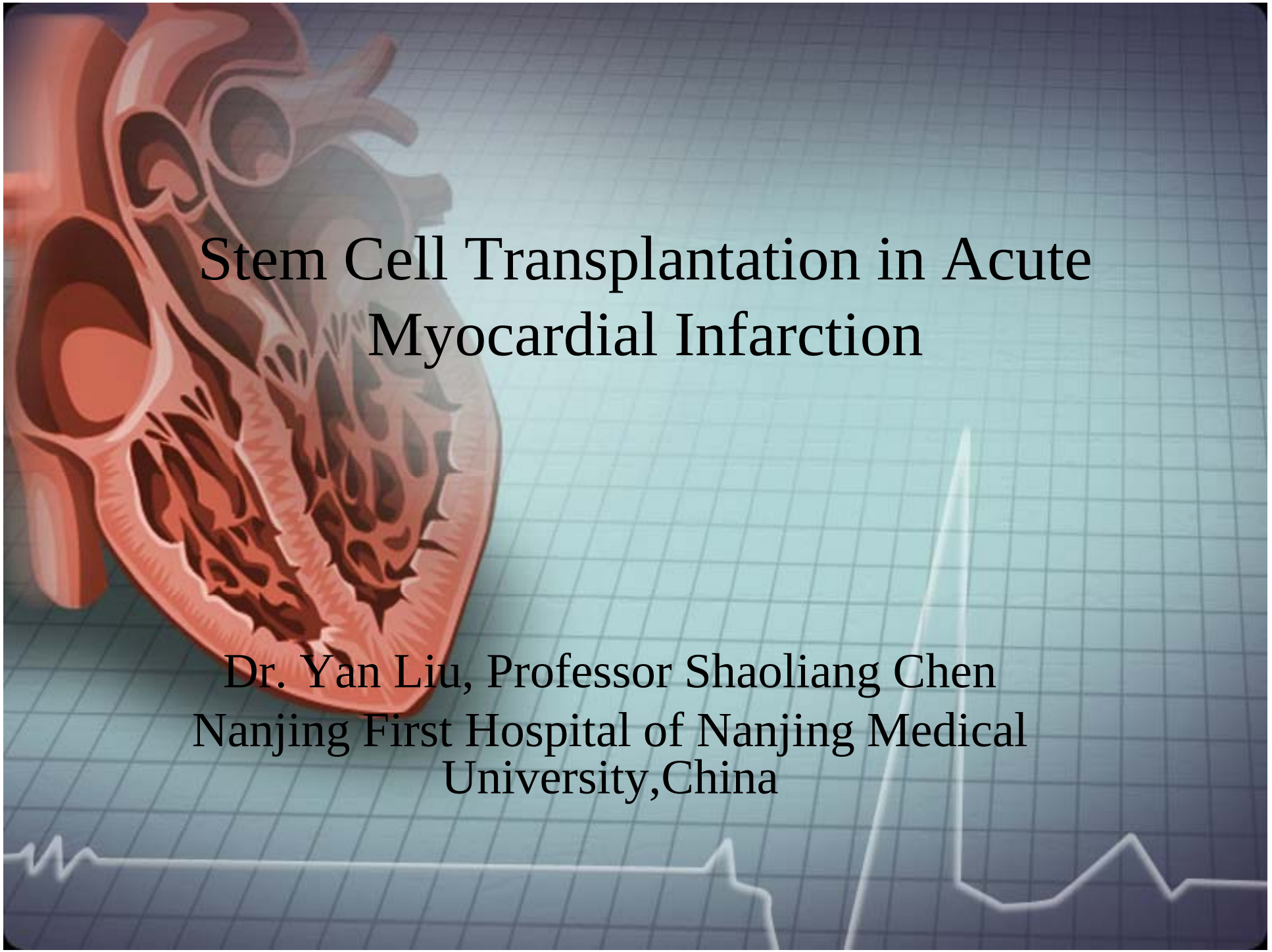


Stem Cell Transplantation in Acute Myocardial Infarction

Dr. Yan Liu, Professor Shaoliang Chen
Nanjing First Hospital of Nanjing Medical University,China

Background

- Ischemic desease
- No. 1 killer in 21st
- 17,000,000 every year, 40% die as a result of the attack.
- Younger
- Imbalance between myocardial oxygen supply and oxygen demand reduction

- stem cell research--- a hot spot
- cell therapy and gene therapy play an important role
- development biology and drug models have a major impact

Stem cell

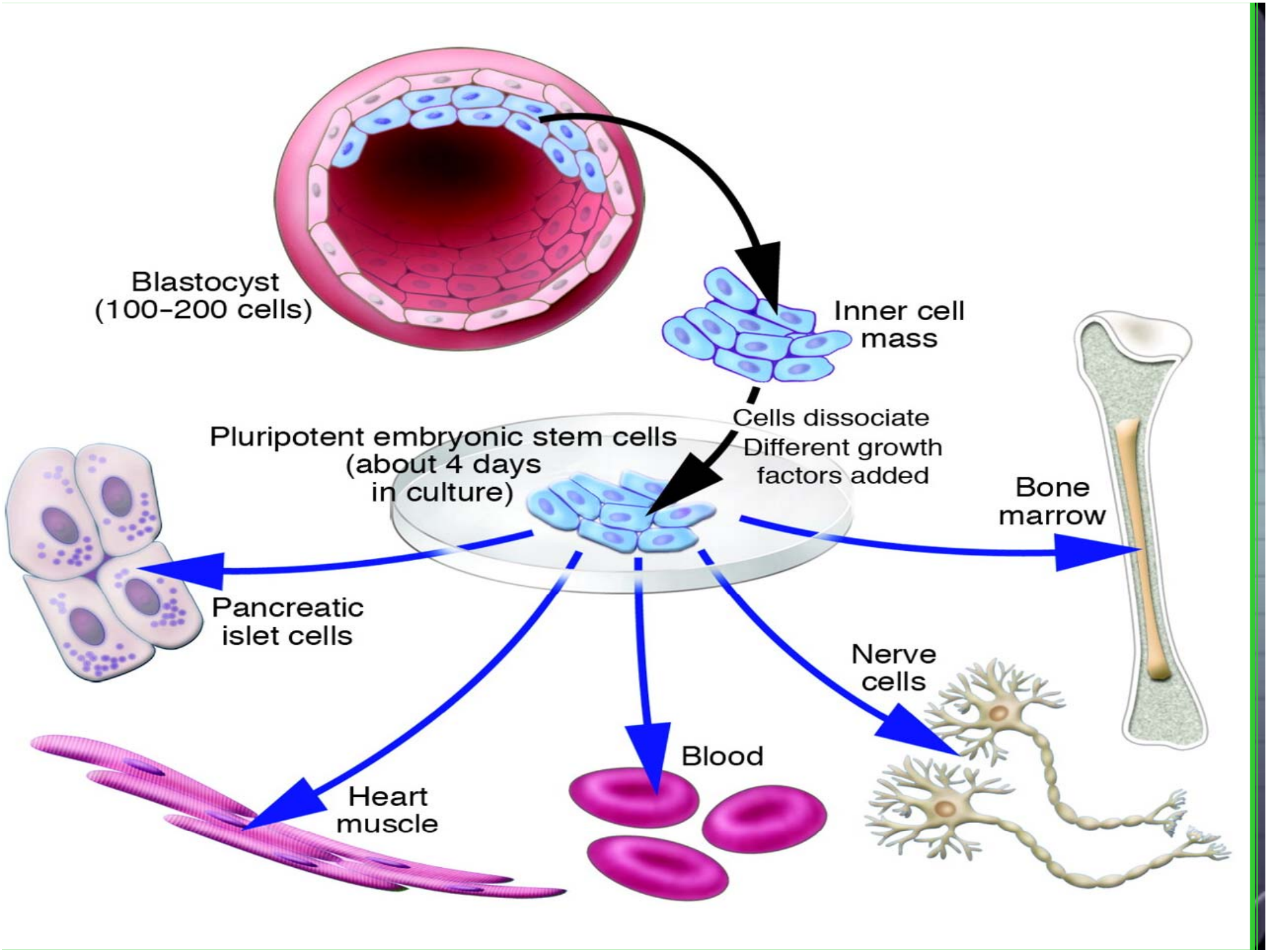
- ***Self-renewal***
- ***Potency***

Soluble Chemical Factors

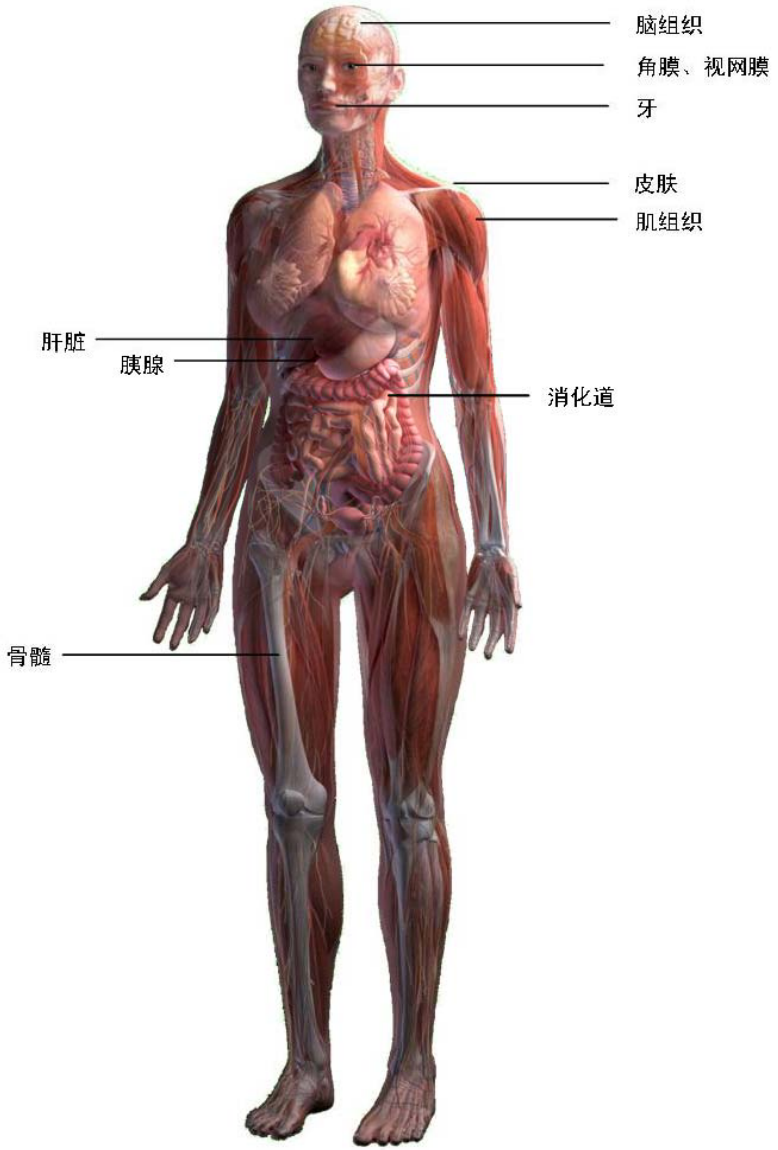
- VEGF (ESCs, HSCs, EPCs)
- TGF-β (ESCs, MSCs, HSCs, EPCs)
- BMP (ESCs)
- FGF (ESCs, HSCs, EPCs)
- IGF (HSCs, EPCs)

Classification

- embryonic stem cell, ESC：
- adult stem cell, ASC：


Blastocyst
(100–200 cells)
Inner cell
mass
Cells dissociate
Different growth
factors added
Pluripotent embryonic stem cells
(about 4 days
in culture)
Bone
marrow
Pancreatic
islet cells
Nerve
cells
Blood
Heart
muscle

成体干细胞在人体内可能的分布



Adult Stem Cells

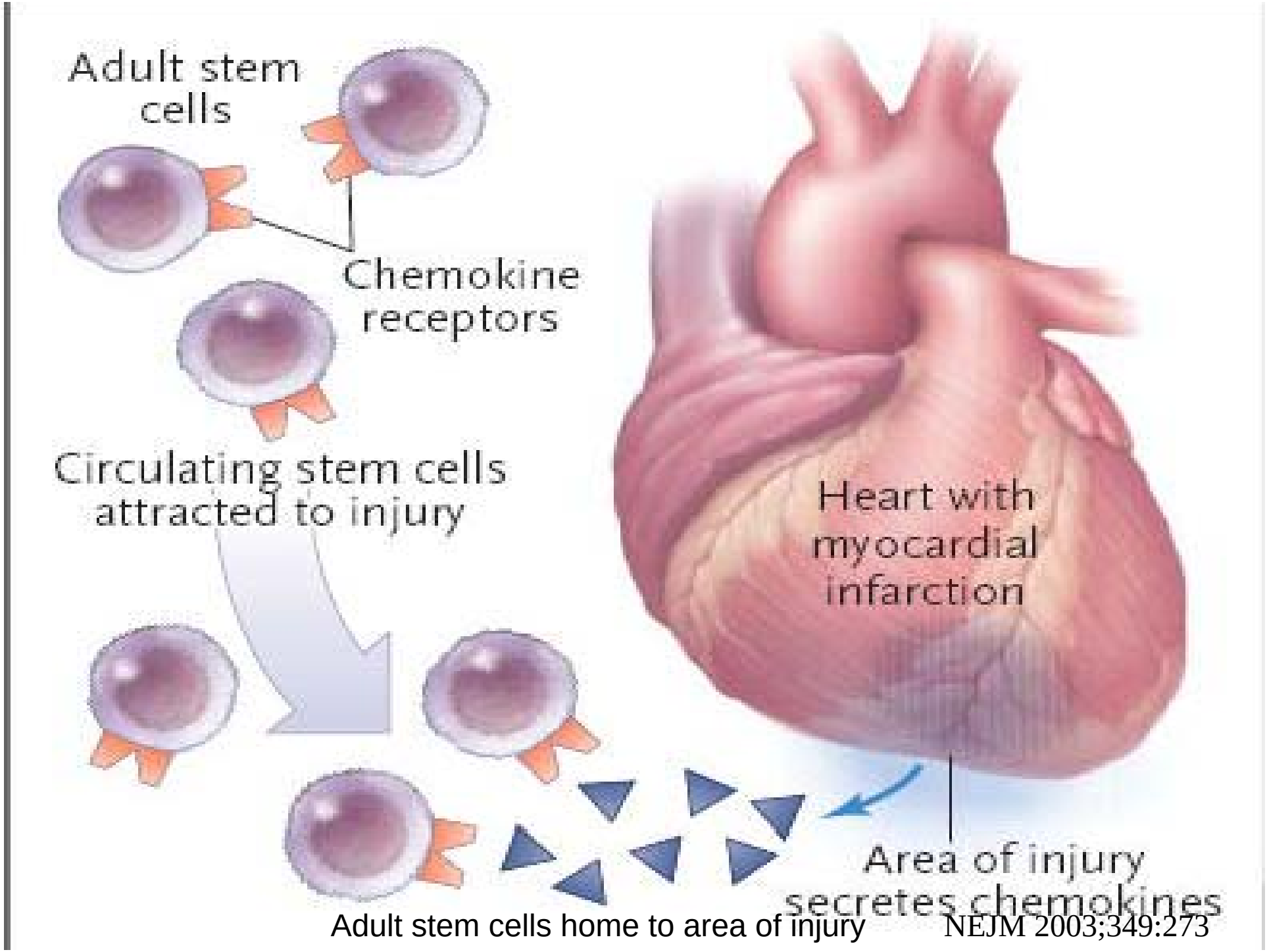
- **- Bone Marrow Stem Cells**
- **- Neuronal Stem Cells**
- **- Muscle Stem Cells**
- **- Liver Stem Cells**
- **- Peripheral Blood Stem Cells**
- **- Pancreatic Stem Cells**
- **- Corneal Limbal Stem Cells**
- **- Umbilical Cord Blood**

Target Diseases

- Stroke
- Myocardial infarction
- Heart Failure
- Spinal cord injury
- Parkinson’s disease
- Amyotrophic Lateral Sclerosis (Lou Gehrig’s Disease)
- Diabetes mellitus

Cell Therapy: How it works

- Replace damaged cells
- Stimulate recovery by secreting growth factors -“Trophic factory”



Adult stem cells home to area of injury NEJM 2003;349:273

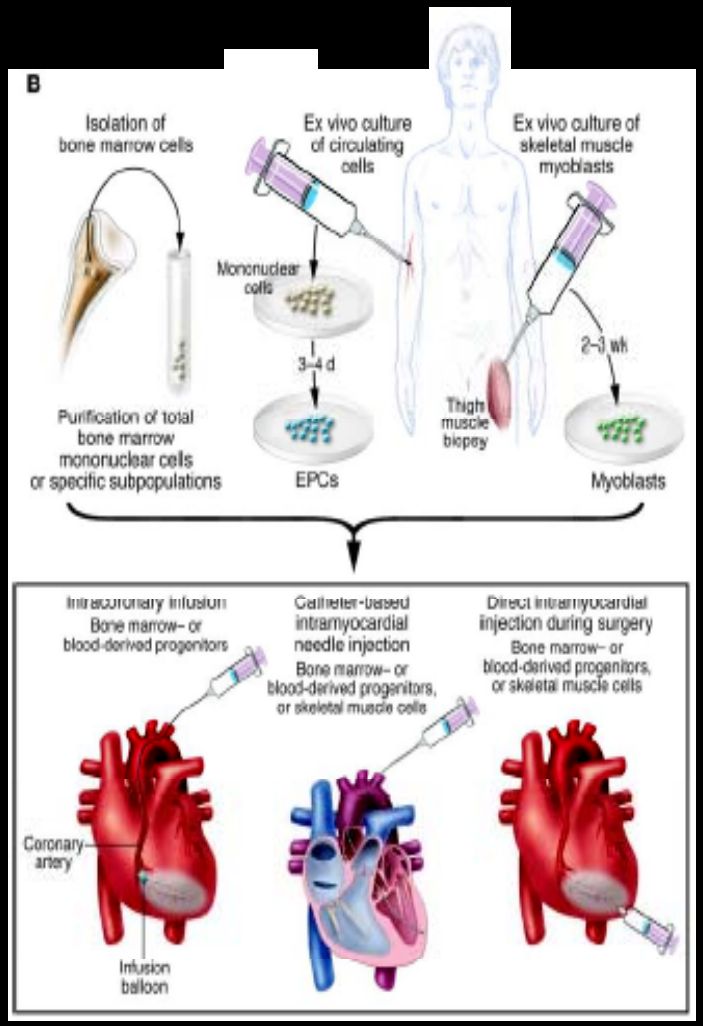
Mechanism

- Differentiation
- Secretion
- Some of the transplanted cells and host cells to establish a power of a mechanical coupling, directly involved in the simultaneous contraction of the host heart.

Clinical randomized study

- Angiogenesis
  - Chronic myocardial ischemia
  - Acute myocardial infarction
- Myogenesis
  - Chronic left heart failure
  - Acute left heart failure

Route of Application



1. Intracoronary Infusion
2. Catheter-based Intramyocardial Needle Injection
3. Direct Intramyocardial Injection During Surgery

Animal experiments

30 miniature pigs
Myocardial infarction model

Treatment group： 22

The control group： 8

Bone marrow stem cells, reinfusion

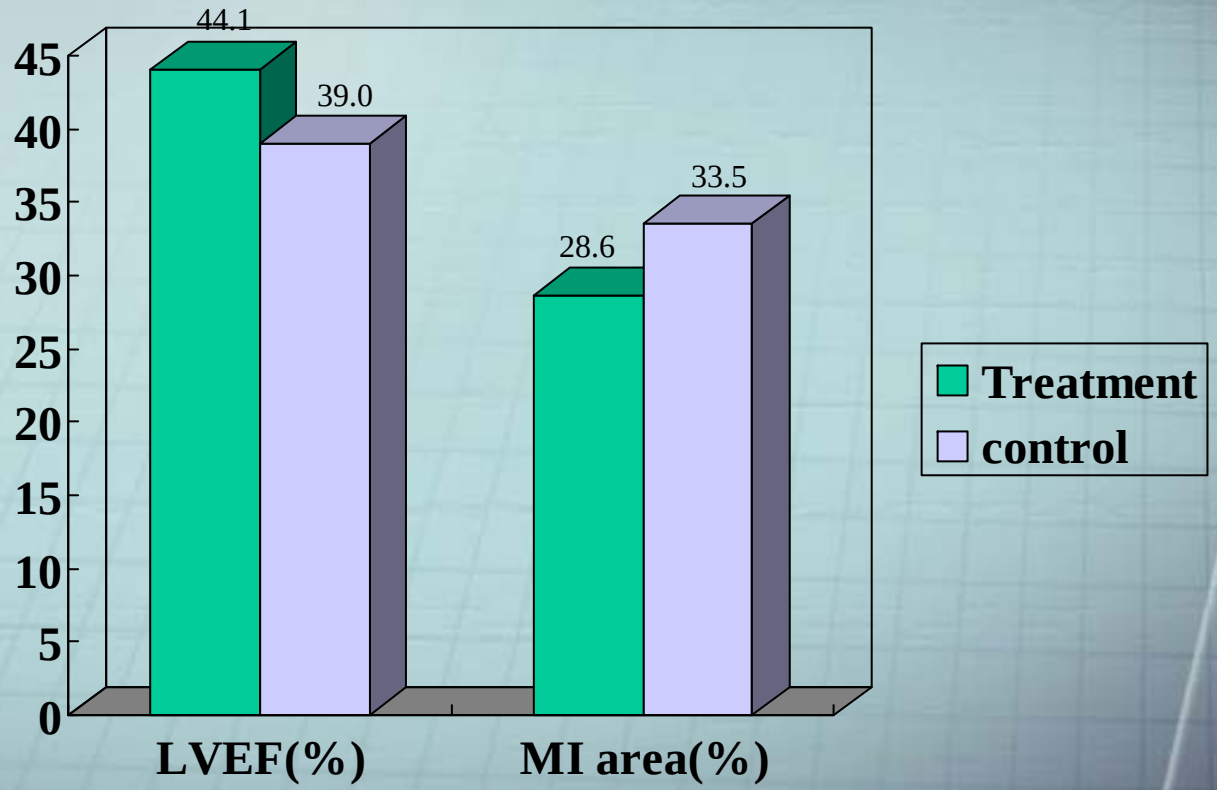
Saline

1 month

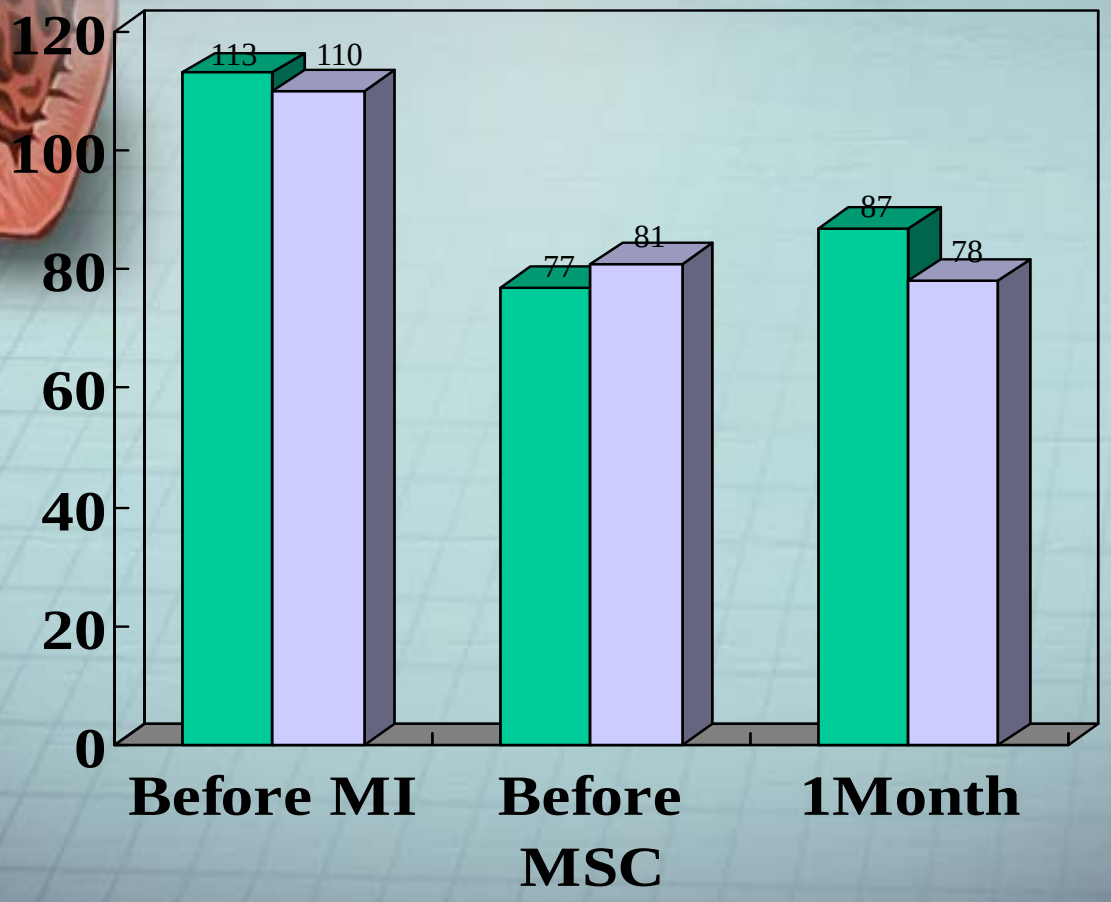
Stem cell culture

- Bone marrow 60ml, Subpackage, add an equal volume of lymphocyte separation medium, 2400r/min, 20min
- Take the middle cell layer, PBS washed twice
- 10ml,10% Serum,DMEM
- 3-5 days for changing fluid, passage about a week

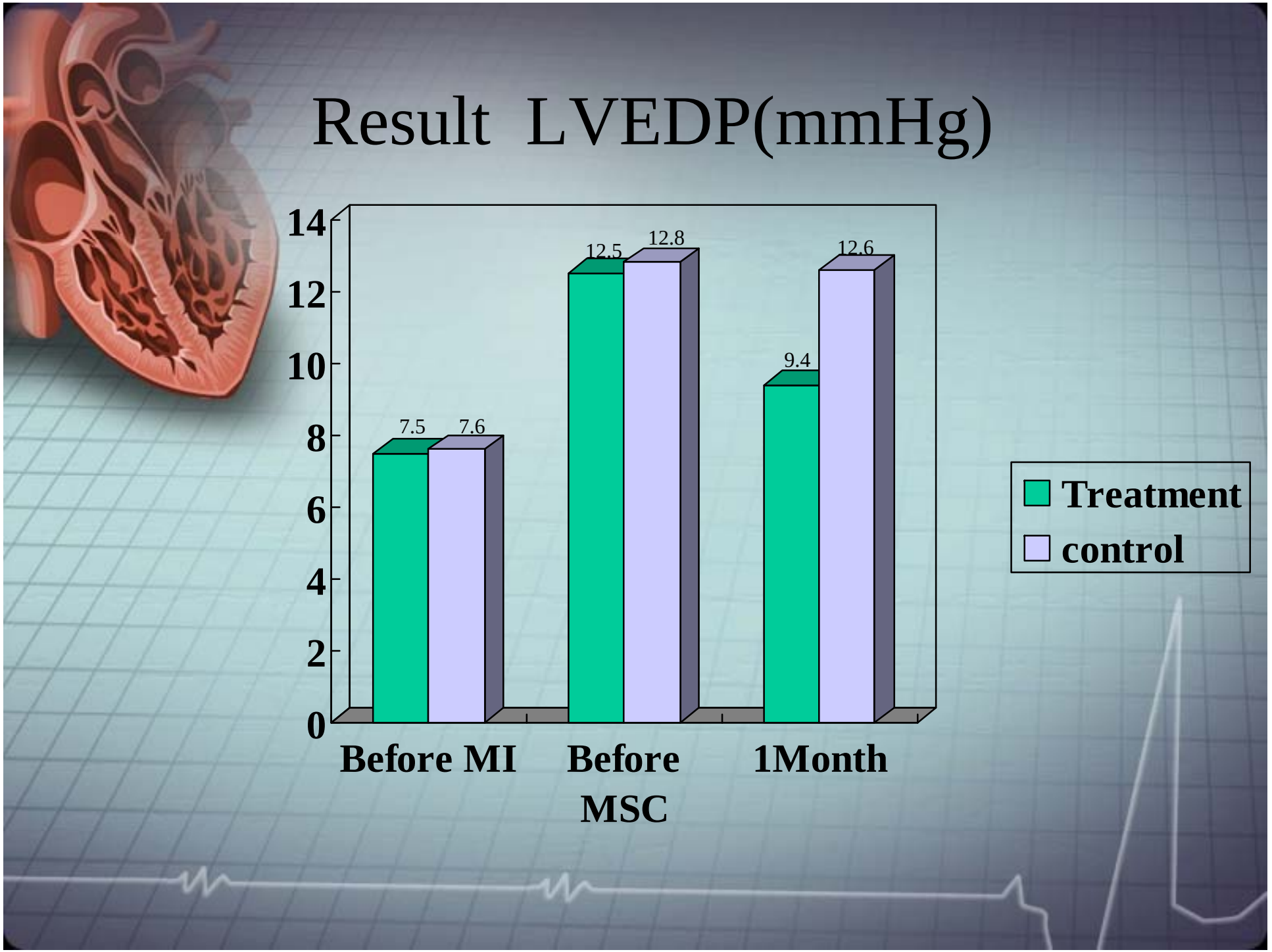
Result


44.1
39.0
33.5
28.6
45
40
35
30
25
20
15
10
5
0
LVEF(%)
MI area(%)
Treatment
control

Result LVSP(mmHg)



Result LVEDP(mmHg)

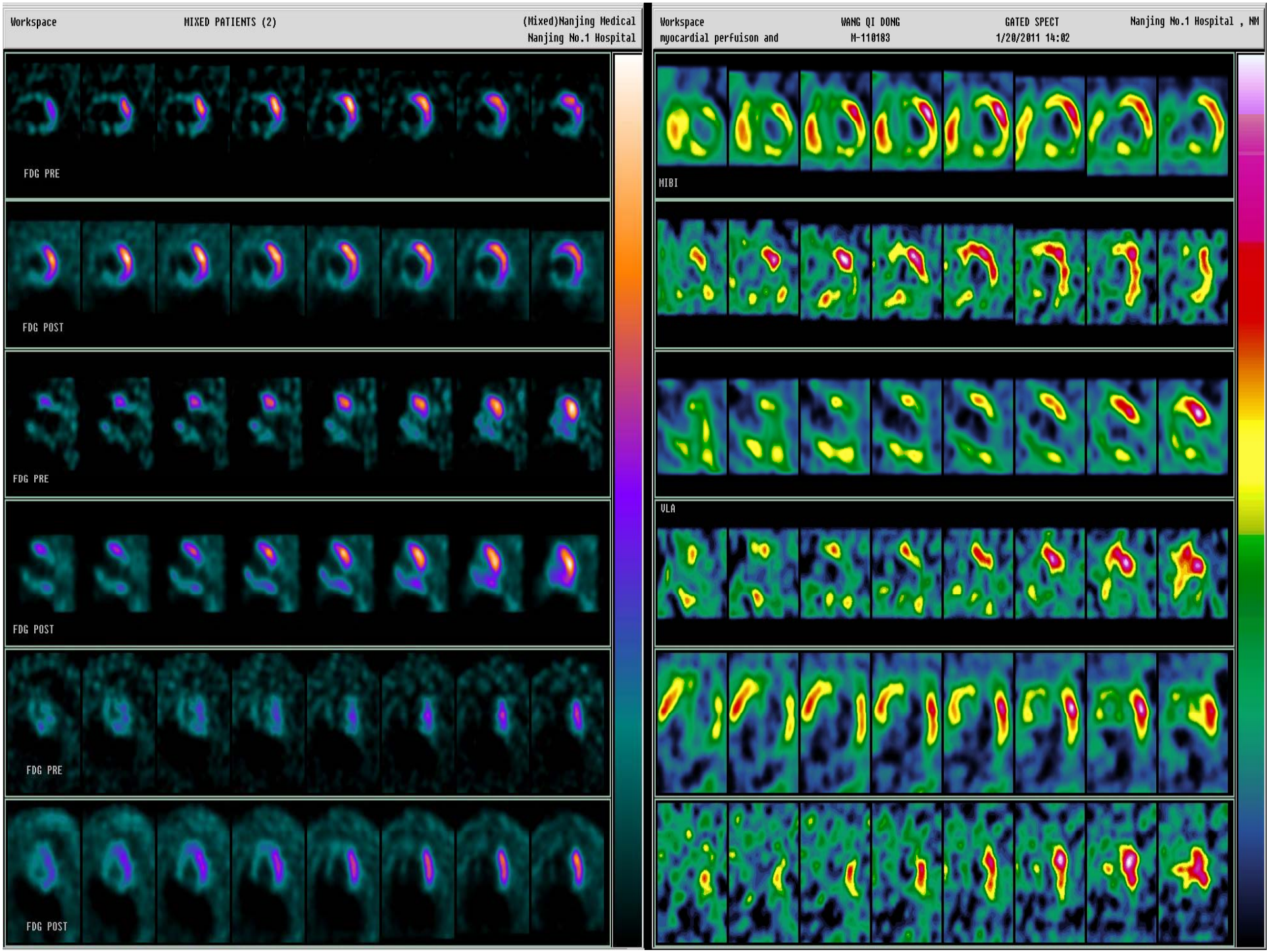


Conclusion

- new cardiomyocytes
- normal function

Clinical Research

- 150 Patients
- Bone marrow stem cell transplantation
- The number of Cells： $2.3\sim8\times10^{6}$ cells/ml
- Route of Application： Catheter-based Intramyocardial Needle Injection
- Cell culture time： 14 days
- Follow-up： 5years (54,20,21,13)


Workspace
MIXED PATIENTS (2)
(Mixed)Nanjing Medical
Nanjing No.1 Hospital
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Summary

- What is stem cell
- The Classification of stem cell
- Animal experiment
- Clinical research