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Original Articles

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Mechanism of osteogenic differentiation of umbilical cord mesenchymal stem cells

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Abstract: Mesenchymal stem cells (MSCS) exist in a variety of tissues and have multi-lineage differentiation potential. Mesenchymal stem cells have great application prospects in the treatment of bone injury diseases. The rapid initiation and efficient induction of osteogenic signaling pathways are the key to mesenchymal stem cell-based bone tissue engineering technology. Multiple signaling pathways have been confirmed to play a regulatory role in the process of osteogenic differentiation of mesenchymal stem cells. This article reviews the research progress of the mechanism of osteogenic differentiation of mesenchymal stem cells.

Keywords: Mesenchymal Stem Cells; Osteogenic Differentiation; Signaling Pathways

1. Overview of mesenchymal stem cells

Mesenchymal stem cells (MSCs) are adult stem cells derived from the mesoderm, which have multi-lineage differentiation potential and repetitive self-renewal ability. They can be isolated from various tissues such as bone marrow, umbilical cord blood, umbilical cord, placenta, and adipose tissue. MSCs have the characteristics of high expression of CD73, CD105, CD90, and low expression of CD45, CD34, CD14, HLA-DR, which is also commonly used to detect whether cells are MSCs. So far there have been several studies have shown that MSCs in immune and hematopoietic regulation, anti-inflammatory, promote angiogenesis and tissue repair are play an important role in the process, and because the MSCs has safe, easy separation, amplification, characteristics of frozen and large-scale preparation, MSCs have become clinically used in stem cell therapy, tissue engineering and regenerative medicine ideal candidate, MSCs therapy also has broad prospects for development. MSCs have the ability to differentiate into osteoblasts, adipocytes, and chondrocytes. More and more studies have revealed a wider range of differentiation potential of MSCs, such as differentiation into muscle cells and neurons.

2. Osteogenic differentiation of mesenchymal stem cells

Mesenchymal stem cells (MSCS) have the ability of multi-lineage differentiation and can differentiate into osteoblasts under certain inducing conditions. MSCS derived from bone marrow, umbilical cord blood, adipose tissue and other tissues all show similar osteogenic differentiation ability. Rapid initiation and efficient induction of osteogenic signaling pathways of mesenchymal stem cells is the key to their application in bone tissue engineering technology.

3. Mechanism of osteogenic differentiation of MSCS

A large number of in vitro studies have found that the pathways regulating osteogenic differentiation of MSC mainly include Wnt/β-Catenin signaling pathway, TGFβ signaling pathway, P38MAPK signaling pathway, ERK signaling pathway, PI3K/AKT signaling pathway, Notch signaling pathway, STAT3 signaling pathway, and NF-κB signaling pathway.

3.1. the Wnt/beta - Catenin signaling pathway

The Wnt/ β-catenin signaling pathway comprises a series of proteins that play key roles in embryonic development and adult tissue homeostasis. On the basis of earlier studies, the Wnt pathway has been divided into classical and non-classical signaling pathways. The classical Wnt pathway, also known as the Wnt/β-Catenin pathway, is associated with nuclear translocation of β-Catenin, which activates target genes via T cell cytokines/lymphopotentiators. The canonical Wnt pathway is mainly related to cell proliferation, while the non-canonical Wnt pathway regulates cell polarity and migration. These two major pathways form a network that can regulate each other.

3.2. TGFβ signaling pathway

The TGFβ superfamily is composed of more than 40 members, which are divided into TGFβs, bone morphogenetic proteins, growth differentiation factors and other subfamilies. There are five isoforms of TGFβ, namely TGF-β1, -β2, -β3, -β4 and -β5. There are only three isoforms of TGFβ in mammals: TGF-β1, -β2 and -β3. TGFβ signaling pathway plays an important role in different environments and tissues, regulating basic processes including embryonic development, proliferation, differentiation, morphogenesis, stem cell maintenance and regeneration. Smad is a crucial transcription factor in TGFβ signaling transduction. The Smad proteins are classified into two types: Co-Smads: Smad4, Smad10; Receptor activated Smads (R-Smads) : Smad1, Smad2, Smad3, Smad5, Smad8; And inhibitory Smads (I-Smads) : Smad6, Smad7. TGFβ pathway is a classical receptor-mediated signaling pathway that activates transcription factors from membrane to nucleus. TGFβ receptors are divided into three types: type I, type II and type III. Type III receptors are not directly involved in signal transduction, while type I and type II receptors are involved in signal transduction and both belong to transmembrane serine/threonine kinase receptor proteins. The activated R-Smads combine with Co-Smads to form complexes and enter the nucleus to directly bind to DNA. The transcription of specific target genes such as Runx2 and Osterix plays a regulatory role. Although the pathway is simple in nature, the TGFβ family has a variety of functional and diverse responses due to the interactions between heteromeric receptors and Smad complexes, the interactions between receptors, the combinatorial interactions between proteins, the interactions between proteins and Smad, and the cooperation with sequence specific transcription factors.[1]

3.3. P38MAPK signaling pathway

Mitogen-activated protein kinases belong to serine/threonine protein kinases. The MAPK signaling pathway plays a regulatory role in a variety of cells, and plays a key role in the process of transmitting signals from extracellular to intracellular to trigger various cellular responses. Mitogen-activated protein kinase kinase kinase phosphorylates the serine site of mitogen-activated protein kinase kinase, followed by phosphorylation of the threonine/tyrosine site of MAPK. P38MAPK is a kind of protein kinase whose tyrosine site can be phosphorylated in 1993. It belongs to the subclass of MAPKs, including six subtypes: α1, α2, β1, β2, γ and δ. The activation of P38MAPK pathway was as follows: MEKKs/TAK→MKK3/MKK4/MKK6→P38MAPK pathway. Different MEK activate different P38MAPK isoforms, and different P38MAPK isoforms can activate different substrates. After activation, P38MAPK can enter the nucleus to regulate a variety of target genes.

3.4. ERK signaling pathway

ERK was first discovered and most studied in the MAPK family, mainly located in the cytoplasm. ERK Ser/Thr protein kinases, including two co-workers isomer ERK1 and ERK2, ERK signaling pathway is the most clear MAPK signaling pathways in the study of a classic pathway, can regulate cell proliferation, differentiation and transformation. The main pathway of ERK signal transduction is Ras/Raf/MEK/ERK. Ras is a monomeric protein with endogenous gtpase activity, which catalyzes the decomposition of GTP to GDP. Raf belongs to Ser/Thr protein kinase, which is a MAPKKK. MEK belongs to the MAPKK family, which has the bispecific function of phosphorylating tyrosine and threonine residues and activating its downstream substrates, including MEK1 and MEK2. ERK signal transduction process: receptor tyrosine kinase is activated by various signals to signal transduction, which activates Ras, and then activates Raf after binding MEK to form a dimer to activate it. After MEK is activated, ERK can be activated by phosphorylation. The activated ERK is transferred to the nucleus and plays a role in the corresponding substrates, most of which are activated by phosphorylation.

3.5. PI3K/AKT signaling pathway

Phosphatidylinositol 3-kinase/protein kinase B pathway is an important intracellular signaling pathway that can regulate the proliferation, differentiation and apoptosis of various types of cells. PI3K can be divided into three types: I, II and III. The substrate of type III PI3K is PI, the substrate of type II is PI and phosphatidylinositol phosphate, and the substrate of type I is PI, PIP and PIP2. PI3K can act on growth factor receptors with phosphorylated tyrosine residues or junction proteins to change their dimer conformation, and can also be ac-

tivated by directly binding to Ras and P110. Neurotrophins or extracellular growth factors bind to transmembrane tyrosine kinase receptors and self-phosphorylate them to recruit and activate PI3K. Activated PI3K catalyzes PIP2 to PIP3 on the cell membrane, and PIP3 can act as a second messenger to bind to intracellular signaling factors AKT and phosphatidylinositol-dependent protein kinase. PDK1 activates AKT phosphorylation and regulates downstream target genes.

3.6. Notch signaling pathway

Notch signaling pathway can regulate almost all cell proliferation and differentiation, and is essential for multiple physiological or pathological processes such as cell proliferation, differentiation, and apoptosis. The Notch pathway includes 4 receptors Notch1/2/3/4, a class of DNA binding protein CSL protein, 5 ligands Delta1/3/4 and Jagged1/2, Hes genes and regulatory molecules. The activation of Notch signaling pathway is mainly through two pathways: One is dependent on the cellular transcription factor CSL, which starts with cell-cell contact. After the Notch ligand on the cell surface binds to the receptor on the neighboring cell membrane, the receptor is cleaved twice by the proteasome, releasing the Notch intracellular domain to the nucleus, binding to CSL protein, and recruitment of co-activator to form a trimer to change the action of CSL protein. It turns from a transcriptional inhibitor to a transcriptional activator, and then regulates the downstream target genes of the Notch signaling pathway. Another way of activation does not depend on the CSL, NICD of Notch signaling pathway in the cytoplasm interaction with the other signaling pathways, such as PI3K/AKT/mTOR, beta catenin pathway, regulate the expression of the corresponding protein.

3.7. Others

In addition to the above signaling pathways, other signaling pathways also regulate osteogenic differentiation of MSCs. Studies have found that nicotinamide mononucleotide (NMN) and vitamin D3 play a role in promoting osteogenic differentiation of MSCs in vivo and in vitro by upregulating SIRT1 signaling pathway. Crosstalk between multiple signaling pathways can also occur to jointly regulate the process of osteogenic differentiation. Cao et al. found that Notch signaling significantly enhanced the activity of BMP9-induced BMP/Smad signaling in vitro and in vivo, and increased the gene expression of essential osteogenic factors in BMP9-induced MSCs. Although the above pathways have been found to be related to the osteogenic differentiation of MSCs, the currently known signaling pathways need to be further studied to explore more effective targets. At the same time, more research is needed to explore more unknown signaling pathways related to the osteogenic differentiation of MSCs.[2]

4. Summary and prospect

With the development of tissue engineering, mesenchymal stem cells have a key application value and broad development prospects in the repair of bone defects and the treatment of bone regeneration, which also makes mesenchymal stem cell therapy a hot topic in bone tissue reconstruction, but mesenchymal stem cell therapy is still a relatively novel treatment. We between the osteogenetic differentiation of mesenchymal stem cells gene regulatory network is more obvious, still need more further research to improve the osteogenetic differentiation of mesenchymal stem cells between the specific mechanism of action, mining more targets, safe and reliable for between mesenchymal stem cells in the treatment of bone defect and bone regeneration provides more possibilities, We also look forward to more breakthroughs in mesenchymal stem cell therapy in the future, and more patients with bone defects and fractures can benefit from mesenchymal stem cell therapy.

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Application of interactive nursing in colostomy nursing of colon cancer patients

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Abstract: Objective: To analyze the application of interactive nursing in colostomy nursing of colon cancer patients Methods: From January 2022 to January 2023, 60 hospitalized patients with colon cancer were selected as participants in this study, and were evenly assigned to the observation group and the control group by random number table method, with 30 patients in each group. The control group was treated with routine nursing, the observation group was treated with interactive nursing, and the nursing effect was compared.Results: After treatment, it was found that the ESCA and GSES scores of the observation group were better than those of the control group, while the anxiety and depression scores of the observation group were lower than those of the control group, P<0.05, and the difference was statistically significant. Conclusion: Interactive nursing for colostomy nursing can effectively improve the nursing effect, and it is worth promoting.

Keywords: Interactive Nursing; Colon Cancer Patients; Colostomy; Nursing Application Effect

Colorectal cancer is a common malignant lesion of digestive system, which is usually surgically resected in clinical treatment. After surgery, patients are often unable to control their bowel excreta on their own, so a colostomy must be performed to collect the excreta [1].In view of the lack of knowledge about colostomy surgery and postoperative self-care, most patients often suffer from greater psychological pressure [2]. Therefore, it is particularly critical to provide efficient nursing support for patients. Based on the principles of respect and equality, the interactive care model provides an in-depth understanding of patients' care needs and helps them enhance their self-care skills and quality of life [3].The purpose of this study was to explore the practical effects of interactive care in post-colostomy care for colorectal cancer patients. The following is a report of the study.

1. Data and methods

1.1 Clinical data

From January 2022 to January 2023, 60 hospitalized patients with colon cancer were selected as participants in this study, and were evenly assigned to the observation group and the control group by random number table method, with 30 patients in each group. In the observation group, male and female patients were equally divided, ranging in age from 32 to 68 years, with a mean age of 55.23 years and a standard deviation of 3.33 years. The course of disease ranged from 1 to 3 years with a mean course of 2.12 years and a standard deviation of 0.11 years. In the control group, there were 16 men and 14 women. The age range was also 32 to 68 years old, with a mean age of 55.78 years and a standard deviation of 3.02 years. The course of disease was between 1 and 3 years, with a mean course of disease of 2.06 years and a standard deviation of 0.28 years. When comparing the baseline data of the two groups, no statistically significant difference was found (P value greater than 0.05), indicating good comparability between the two groups.

1.2 Methods

In the control group, standardized nursing measures were adopted. The patient's vital indicators were continuously tracked, and the nursing team made ward rounds on time to pay close attention to the patient's health status; Instruct patients to take medication on time, and record the reaction after medication in detail; Patients are advised to maintain a simple diet and improve protein intake; Patients are regularly followed up on their recovery after discharge, either by phone or through home visits. In the experimental group, a participatory nursing program was implemented.

1. Preoperative comprehensive evaluation:The medical team collaborates to conduct a comprehensive evaluation of the patient's

overall condition, including understanding, physical condition, emotional response, self-management ability, etc., establish a harmonious doctor-patient relationship with the patient, win their trust, provide encouragement and comfort, grasp the patient's nursing requirements and strive to achieve them, and ensure that the patient enjoys targeted, all-round and tailored nursing services. Maintain patient peace of mind.

2. Preoperative communication:Improve patients' understanding of their own disease by distributing health guides and holding health lectures, and explain surgical procedures and matters needing attention to patients to guide them to establish accurate disease cognition; Insight into the patient's inner thoughts, through the analysis of healing examples to enhance the patient's belief against the disease, dispel their negative emotions.

3. Postoperative rehabilitation guidance：Assist patients to establish normal eating and excretion habits, and teach patients and their families the correct use and replacement of ostomy bags; Guide patients to review important moments in their lives in order to stimulate a new understanding of the value of life and alleviate feelings of helplessness and despair after surgery; Take the initiative to communicate with the family members of the patient, emphasizing that the family members should give more companionship and support to the patient, so that the patient can feel the care of the family; After discharge, regular family visits or telephone visits should be conducted to understand the actual needs of patients; We use wechat and other communication tools to provide consultation services for patients and help patients solve various problems during home rehabilitation.

1.3 Observation Indicators

The self-care ability of the two groups of patients was evaluated: ESCA (ESCA) was used to evaluate the patients, the total score was 84, and the patients with higher score had higher self-care level. The emotional status of the two groups of patients was compared: SAS and SDS were used to evaluate the standard score of 50 points and 53 points, the total score was 100 points, the higher the score, the higher the anxiety and depression.

1.4 Statistical Methods

The data were substituted into SPSS21.0 software for processing and analysis, and the measurement data were represented by (x±s), and T-test was performed. The count data were expressed as % and tested by $\chi 2$. $P<0.05$, the difference was statistically significant.

2. Results

2.1 ESCA and GSES scores of the two groups were compared

The ESCA and GSES scores of the two groups were compared, and the observation group was better than the control group ($P<0.05$), the difference was statistically significant. The specific results are shown in Table 1.

Table 1 Comparison of ESCA and GSES scores (x±s) between the two groups

group	quantity	ESCA		GSES	
		Before	later	Before	later
Observation group	30	30.32±3.21	57.75±2.91	15.24±2.81	24.38±2.91
Control group	30	30.65±73.54	48.43±2.02	15.41±2.12	20.53±2.32
t		0.0246	14.4106	0.2645	5.6662
P		0.9805	0.0000	0.7923	0.0000

2.2 The anxiety and depression scores of the two groups were compared

By comparing the scores of anxiety and depression between the two groups, the observation group was better than the control group ($P<0.05$), and the difference was statistically significant. The specific results are shown in Table 2.

Table 2 Comparison of anxiety and depression scores between the two groups (x±s)

group	quantity	SAS		SDS	
		Before	later	Before	later
Observation group	30	50.43±2.43	24.12±0.43	53.46±1.53	24.26±0.91
Control group	30	50.54±1.52	32.53±0.32	53.36±1.23	33.08±0.32
t		0.2102	85.9387	0.2790	50.0808
P		0.8342	0.0000	0.7812	0.0000

3.Discussion

With the enhancement of health awareness, the field of clinical nursing pays more attention to the interaction and communication between patients, and high-quality nursing services can effectively improve patients' treatment effectiveness and self-care skills.For colon cancer patients undergoing colostomy, due to changes in the physiological structure of the digestive tract, they often face problems such as inflammation and edema of the skin around the stomy. These problems not only increase the psychological pressure of patients, but also may cause anxiety, depression and other adverse emotions, which seriously interfere with the daily life of patients.Therefore, it is necessary to implement appropriate nursing interventions for patients[4] . The survey found that after nursing intervention，For example, nursing staff should keep the ward clean, quiet and comfortable, adjust the appropriate temperature and humidity, create an environment conducive to physical and mental recovery for patients, and gradually encourage patients to communicate with fellow patients, share each other's experience and feelings, enhance the sense of social support, reduce loneliness. Listen patiently to the emotional expression of the patient in life and understand the reasons behind their negative emotions, such as pain, fear, worry about the future, etc. Use psychological counseling techniques, such as cognitive behavioral therapy, relaxation training, etc., to help patients adjust their mindset, relieve anxiety, depression and other emotions, the experimental group significantly surpassed the control group in self-care skills and self-confidence. The reason for this is that in the nursing interaction, the medical team jointly evaluates the patient's condition, which helps to develop more accurate care plans, thus enhancing the effectiveness of care[5].

In summary, interactive nursing has significant effects in postoperative nursing of colon cancer patients receiving colostomy, which can effectively improve patients' self-care ability and confidence and reduce patients' negative emotions, and has high clinical promotion value.

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Rapid Recognition and Management of Critical Illnesses in Emergency Medicine

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Abstract: As an important part of clinical medicine, emergency medicine bears the important responsibility of rapid identification and effective treatment of patients with acute and critical illnesses. The purpose of this paper is to discuss the rapid identification of critical illnesses in emergency medicine and its treatment strategy, through the analysis of vital signs monitoring, identification of acute and critical symptoms, first aid skills and operation standards, etc., to provide emergency physicians with a set of scientific and systematic response program, with a view to improving the efficiency of emergency treatment and patient survival rate.

Keywords: Emergency Medicine; Critical Illness; Rapid Identification; Treatment

Introduction

Emergency medicine usually refers to patients with organ failure or severe ischemia and hypoxia, with rapid development and poor prognosis, requiring immediate medical intervention. Emergency physicians need to have a high degree of alertness and professionalism, and be able to make accurate judgment of the condition and take effective measures within a short period of time. This paper will discuss two aspects of rapid identification and treatment of critical illnesses.

1. Rapid Identification of Critical Illness

1.1 Vital Signs Monitoring

Vital signs are the basis for evaluating the patient's condition. Emergency physicians should pay close attention to the patient's temperature (T), pulse (P), respiration (R), blood pressure (BP) and other basic vital indicators. In addition, consciousness (C), pupil (A), urine (U), and skin mucosa (S) are also key signs to identify critical illnesses, collectively known as the "eight signs of life". Normal body temperature is 36-37 ℃, abnormal body temperature suggests infection, hypothermia or hyperthermia. Pulse is 60-100 beats/minute in normal adults; arrhythmia and weak pulse may indicate shock. Respiration is 16-20 breaths/minute in normal adults. Abnormal respiration, including abnormal frequency, rhythm, depth and sound, is an early sign of respiratory failure. Blood pressure <90mmHg systolic or <60mmHg diastolic may indicate shock. Blurring or drowsiness is a precursor to coma, and a Glasgow Coma Scale <9 requires high alert. Bilateral unequal, dilated, or fixed pupils suggest severe brain lesions or cardiac arrest. Decreased urine output is an early sign of shock and acute renal failure. Pale, clammy and cyanotic skin and mucous membranes suggest circulatory disorders or shock.

1.2 Recognition of Signs of Acute and Critical Diseases

In the rapid identification of critical illness, the assessment of the mental status of clinical symptoms is particularly critical, and is often quantitatively assessed using the Glasgow Coma Scale (GCS), which scores the patient's eye-opening response, verbal response, and limb movement, with a total score ranging from 3 to 15 points. Specifically, for eye-opening response, the patient scored 4 points for spontaneous eye-opening, 3 points for eye-opening after calling, 2 points for eye-opening after tingling, and 1 point for no eye-opening response at all; for verbal response, the patient scored 5 points for a relevant answer, 4 points for an irrelevant answer, 3 points for a word only, 2 points for a sound only, and 1 point for no verbal response at all; and for limb movement, the patient scored 6 points for being able to move according to the command, 5 points for being able to localize the painful stimulus, and 5 points for being able to locate the painful stimulus. The lower the GCS score, the worse the patient's mental status and the more critical his/her condition. In addition to the assessment of mental status, the observation of symptoms such as dyspnea, chest pain, and abdominal pain is also crucial. Dyspnea is a common manifestation of respiratory

system critical illness, and patients may have symptoms such as shortness of breath, labored breathing, and nasal flaring. Chest pain is an important signal of critical cardiovascular disease, and patients may feel pressure, tightness, or burning sensation in the chest, and the pain may radiate to the neck, jaw, or arms[1]. Abdominal pain may indicate the presence of critical illness in the digestive system, and the patient may feel dull, sharp, or colicky pain in the abdomen, and the pain may be accompanied by nausea, vomiting, and diarrhea. The main points are summarized in Table 1 below

Table 1 Disease Point Assessment Scale

Symptom	Evaluation Indicators	Critical Condition Judgment
Mental Status	GCS Score	GCS Score < 9: Condition is critical and requires immediate intervention.
Breathing Difficulty	Breathing rate, degree of respiratory effort	Breathing rate > 30 breaths per minute or significant respiratory effort: Condition is critical.
Chest Pain	Pain location, nature, radiation	Chest pressure, tightness, or burning sensation with pain radiating to the neck, jaw, or arms: Condition is critical.
Abdominal Pain	Pain location, nature, accompanying symptoms	Dull, sharp, or cramping abdominal pain with nausea, vomiting, or diarrhea: Condition may be critical.

Through careful observation and quantitative assessment of clinical symptoms, emergency physicians can more accurately determine the degree of criticality of the patient's condition and formulate timely and effective treatment plans accordingly.

2. Strategies for the Treatment of Critical Illnesses

2.1 First Aid Skills and Operation Standards

2.1.1 Cardiopulmonary Resuscitation (CPR)

CPR is a kind of emergency treatment for patients with cardiac arrest, aiming at restoring blood circulation and respiratory function by artificial means, so as to save patients' lives. The first step is to assess and check the patient's consciousness by tapping the patient's shoulder and calling out loudly to see if there is any response. Determination of respiration and pulse is usually accomplished by seeing, hearing, and feeling (observing the rise and fall of the chest, listening for breath sounds, and feeling the carotid artery pulsations). Next, lay the patient flat to loosen the collar and pants belt. The site of compression is the middle and lower 1/3 junction of the sternum vertically downward. Depth of compression is at least 5 cm for adults, 2-3 cm for children, and 1-2 cm for infants.The frequency of compression is at least 100 times/minute, which is kept even and strong, and the chest should be completely rebounded after each compression [2]. At the same time, artificial respiration is given, and the volume of each blow should cause the chest to lift, and the blowing time lasts for more than 1 second, with a frequency of 10-12 times/minute. AED can also be used, following the voice prompts of the AED.After the AED analyzes the heart rhythm, if defibrillation is recommended, defibrillation should be carried out immediately, and then CPR should be continued.

2.1.2 Airway Management

Ensuring that the patient's airway is clear is the first task of first aid. Airway obstruction can lead to hypoxia and asphyxia, seriously threatening the patient's life. In the process of first aid, a suction device or finger can be used to remove foreign bodies and secretions in the patient's mouth. For comatose or unconscious patients, suction operation should be routinely performed. When routine clearing of the airway is ineffective, the use of oropharyngeal airway, nasopharyngeal airway or tracheal intubation should be considered to establish an artificial airway. Oropharyngeal airway is suitable for patients who are unconscious but not in danger of vomiting; nasopharyngeal airway is suitable for patients who need prolonged ventilation and the mouth cannot be opened; tracheal intubation is suitable for patients who need prolonged mechanical ventilation or have severe airway obstruction. The established artificial airway should be properly secured to prevent dislocation or displacement. Regularly check the patency and fixation of the airway, and promptly clean up secretions and change the humidifying fluid.

2.1.3 Rapid Establishment of Intravenous Access

Intravenous access is an important way for infusion, blood transfusion and drug administration, especially when dealing with shock,

poisoning and other acute and critical patients, rapid establishment of intravenous access is crucial. Priority should be given to thick, straight and elastic veins, such as elbow median vein and noble vein. Prepare infusion sets, syringes, sterilization supplies (e.g., iodophor, alcohol), cotton swabs, adhesive tape, etc. Make sure all items are sterile. Sterilize the puncture site with iodophor or alcohol in an area large enough to reduce the risk of infection. For puncture, the needle is placed at an appropriate angle to the skin (usually 15-30 degrees) and the vein is rapidly punctured. After returning blood is seen, the needle is secured, the infusion set is connected, and the drip rate is adjusted. Secure the needle properly with adhesive tape to prevent it from moving or falling off. Closely observe the infusion, including the drip rate, any localized swelling and pain. Before establishing intravenous access, the patient's condition and venous status should be fully assessed, and the appropriate vein and puncture method should be selected.

2.2 Advanced Life Support Skills

2.2.1 Use of Emergency Medications

In emergency medical situations, the rapid and accurate use of emergency medications is crucial. This requires healthcare professionals to be familiar with the role and usage of commonly used emergency medications, as well as the related precautions. Commonly used first aid drugs include: epinephrine is used in emergencies such as anaphylactic shock and cardiac arrest, which can rapidly constrict blood vessels, elevate blood pressure, and help restore the heartbeat. Atropine is mainly used to relieve muscarinic symptoms caused by organophosphorus pesticide poisoning, such as narrowed pupils and difficulty in breathing. Before using any emergency medication, it is important to confirm the patient's identity and condition to ensure the correct choice of medication [3]. Administer the drugs in strict accordance with the dosage and method of use of the drug instructions or medical prescriptions. The patient's response needs to be closely observed during the process of drug administration, and the treatment program should be adjusted in a timely manner. Record the time, dose, route and patient response of drug administration to provide a basis for subsequent treatment.

2.2.2 Poisoning First Aid

Poisoning first aid requires medical personnel to quickly identify the source of poisoning and take effective measures to remove the poison, while giving antidotes and supportive treatment to minimize the damage of poison to the patient. Rapidly identify the source of poisoning by inquiring medical history, observing symptoms, and detecting poisons. Adopt different removal methods according to the route of poisoning, such as inducing vomiting, gastric lavage, and catheterization. For skin contact poisoning, remove contaminated clothing immediately and rinse the skin with water. Give appropriate antidotes according to the type of poisoning, such as atropine for organophosphorus poisoning. Give supportive treatment, such as oxygen, rehydration, correction of electrolyte disorders, etc., to maintain the patient's vital signs stable.

2.2.3 Trauma Treatment

Trauma treatment is an important part of first aid work, for bleeding wounds, immediate hemostatic measures need to be taken, such as compression hemostasis, tourniquet hemostasis and so on. Pay attention to the use time of the tourniquet, to avoid prolonged use leading to limb necrosis. After cleaning and treating the wound, bandage it with a sterile dressing to protect the wound and reduce the risk of infection. The dressing should be tightened appropriately to avoid over-tightening which may lead to local ischemia or over-loosening which may lead to dislodgement of the dressing. For fractures and other wounds that require immobilization, splints and bandages should be used to reduce pain and prevent further injury. When immobilizing, attention should be paid to the length and width of the immobilizer to avoid too tight or too loose [4]. When transporting trauma patients, care should be taken to protect the patient's wound and fixation to avoid secondary injury during transportation. According to the patient's injuries and handling conditions, choose the appropriate mode of transportation, such as stretcher, wheelchair and so on. In the process of transportation, the patient's vital signs and condition changes should be closely observed.

3. Clinical Response Strategies for Critical Illnesses in Emergency Medicine

3.1 Clinical Decision Making and Rapid Response

In emergency medicine, clinical decision-making and rapid response mechanism are crucial for the clinical response strategy of critical

illnesses. First, clinical decision support systems (CDSS) provide immediate and accurate decision support for healthcare professionals by integrating patients' clinical information and structured knowledge bases, helping doctors to quickly assess the condition and develop preliminary treatment plans. Such systems can significantly shorten decision-making time and improve treatment efficiency. Second, the establishment of rapid response mechanisms (e.g., Rapid Response Team RRT) ensures rapid and effective intervention when a patient's condition deteriorates rapidly.RRT members include experienced healthcare workers who have been professionally trained to quickly recognize a crisis situation and initiate the emergency treatment process.

3.2 Emergency Care Techniques and Operational Standards

Emergency physicians need to be proficient and up-to-date in a variety of first aid techniques and codes of practice. This includes, but is not limited to, cardiopulmonary resuscitation (CPR), airway management, rapid establishment of intravenous access, defibrillation by electric shock, and emergency surgical management. These techniques and codes of practice are fundamental to the management of critical illnesses, and doctors need to practice, be trained and assessed in practice to ensure that they can be performed quickly and accurately in emergencies and to minimize operational errors and risks.

3.3 Teamwork and Communication

Teamwork and communication are critical when dealing with critical illnesses. Emergency physicians need to work closely with other healthcare professionals, such as nurses, technicians, and pharmacists, to develop and implement treatment plans. Effective communication ensures that information flows freely between team members, avoiding misunderstandings and omissions, and thus improving the efficiency of treatment. A clear division of roles and collaborative mechanism should be established among team members to ensure rapid response and teamwork during emergencies. In addition, emergency physicians need to communicate and collaborate with physicians from other departments, especially those from intensive care units, operating rooms, and specialized wards. Through interdisciplinary cooperation and communication, patients can be provided with more comprehensive and personalized treatment plans to improve the success rate of treatment.

Conclusion

Rapid recognition and management of critical illnesses in emergency medicine is the core task of the clinical specialty of emergency medicine. By mastering basic skills such as monitoring vital signs, recognizing signs of acute and critical illnesses, first aid techniques and operation norms, as well as strengthening teamwork and communication, emergency physicians can significantly improve the efficiency of emergency treatment and the survival rate of patients. In the future, with the continuous progress of medical technology and the continuous improvement of emergency medicine system, we have reason to believe that the level of emergency treatment will be further improved.

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Radiologic Diagnosis and Differential Diagnosis of Traumatic Fractures

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Abstract:This study aims to evaluate the effectiveness of radiologic methods such as X-ray, CT, and MRI in the diagnosis of traumatic fractures by detailed analysis. The diagnostic performance of these methods is assessed, and the accuracy of differential diagnosis with similar conditions is explored. By providing specific data and case examples, we hope to offer more detailed and accurate guidance for the radiologic diagnosis and differential diagnosis of traumatic fractures, ultimately enabling more precise treatment plans for patients.

Keywords: Traumatic Fractures; X-ray; CT; MRI; Diagnostic Accuracy; Differential Diagnosis

Introduction

Traumatic fractures are a common clinical condition resulting from injuries, and their accurate diagnosis and timely treatment are crucial for patient recovery. With continuous advancements in medical imaging technology, methods such as X-ray, CT, and MRI are playing increasingly important roles in the diagnosis of traumatic fractures. However, each imaging method has its own advantages and disadvantages, making the rational selection and use of these methods to improve diagnostic accuracy a primary concern for clinicians and radiologists.In addition, the radiologic diagnosis of traumatic fractures faces challenges in differentiating them from various similar conditions[1]. Diseases such as localized soft tissue contusions, ligament injuries, and joint dislocations can present with imaging features similar to those of traumatic fractures, leading to potential misdiagnosis or missed diagnoses. Therefore, establishing a scientific and accurate differential diagnosis process is essential for enhancing the diagnostic accuracy of traumatic fractures.

1. Materials and Methods

1.1 Patient Data

This study retrospectively analyzed the clinical and radiologic data of 500 patients with traumatic fractures treated at our hospital between 2018 and 2022. The patients ranged in age from 18 to 80 years, with an average age of 45 years. Among them, there were 300 male patients and 200 female patients. The causes of injury primarily included traffic accidents (280 cases), falls from height (120 cases), sports injuries (70 cases), and other causes (30 cases).

1.2 Imaging Examination Methods

(1) X-ray Examination:All 500 patients in this study underwent X-ray examinations, which are the cornerstone of the initial diagnosis of traumatic fractures. During the examination, patients were positioned for anteroposterior and lateral views, or special views tailored to specific anatomical regions. The equipment used was the advanced Philips Digital Diagnost DR system, renowned for its high resolution and excellent image quality. Technicians meticulously adjusted exposure parameters such as kilovoltage (kV) and milliampere-seconds (mAs) based on the patient's body part and size to obtain optimal image contrast and clarity, ensuring clear visibility of fracture lines and other bone structure details.

(2) CT Examination:For the 150 patients whose diagnoses were inconclusive or suspected from X-ray images, further detailed assessment was performed using CT scans. The Siemens SOMATOM Definition AS+ 128-slice spiral CT scanner was used, known for its high-precision imaging and multi-slice spiral scanning technology, providing more detailed diagnostic information. During scanning, the device parameters were set to 120 kV and 200 mAs, ensuring sufficient penetration and image quality. The slice thickness was set to 1 mm, with a reconstruction interval of 0.7 mm, aiding in the capture of minute fracture lines and bone fragments[2]. Both bone window and soft tissue win-

dow settings were utilized to assess bone integrity as well as surrounding soft tissue conditions .

(3) MRI Examination: For the 100 patients suspected of having associated soft tissue injuries or specific types of fractures, MRI examinations were conducted. The GE Signa HDxt 1.5T MRI scanner was used, offering excellent soft tissue resolution. Using routine T1-weighted, T2-weighted, and STIR sequences, we could clearly display fracture lines and accurately assess surrounding soft tissue damage, such as tendons, ligaments, and joint capsules. The multi-sequence imaging capability of MRI provides a unique advantage in diagnosing complex fractures and associated soft tissue injuries.

1.3 Image Analysis

All radiologic data, including X-ray films, CT scans, and MRI images, were independently analyzed by two radiologists with extensive professional knowledge and experience. During the review process, the radiologists meticulously recorded the type of fracture (such as transverse, oblique, spiral, or comminuted) and precisely marked the specific location of each fracture. They also comprehensively assessed the displacement of the fractures, categorizing them into angulated, lateral, and shortened displacements. In addition to evaluating the fractures, the radiologists paid particular attention to and documented any other potential abnormalities, such as joint dislocations, soft tissue swelling, and the presence of foreign bodies. If there were discrepancies between the diagnoses of the two radiologists, they conducted in-depth discussions, considering the patient's medical history, physical signs, and other auxiliary examination results[3]. Through this collaborative approach, they reached a consensus to ensure diagnostic accuracy. This dual-review and discussion mechanism significantly enhanced the reliability and precision of the diagnoses .

1.4 Differential Diagnosis Process

In the diagnosis of traumatic fractures, differential diagnosis is crucial to avoid misdiagnosis or missed diagnoses. A rigorous differential diagnosis process was developed by combining detailed patient history, comprehensive physical examinations, and radiologic findings. This process focuses particularly on distinguishing traumatic fractures from conditions such as localized soft tissue contusions, ligament injuries, joint dislocations, and bone tumors.The differential diagnosis involves careful analysis of imaging features, including fracture lines, distribution of bone fragments, and soft tissue swelling. Additionally, it incorporates information from the patient's history, such as the mechanism of injury, pain characteristics, and location, along with physical examination data on joint stability and range of motion.This comprehensive approach aims to ensure accurate diagnosis for each patient, providing a solid foundation for subsequent treatment. It also serves to protect the health and safety of patients by preventing diagnostic errors and ensuring appropriate and timely medical intervention.

2. Observation Indicators

To ensure the comprehensiveness and accuracy of the diagnosis of traumatic fractures, this study set multiple observation indicators. The primary focus is on the detection rate and missed diagnosis rate of fractures, which are fundamental metrics for evaluating the effectiveness of diagnostic methods, reflecting their sensitivity and reliability directly. Secondly, the diagnostic accuracy of fracture types is crucial, as different types of fractures require different treatment plans. Accurately identifying the type of fracture is essential for the patient's treatment and recovery. Similarly, the accuracy of diagnosing the fracture location is critical, as it directly impacts the choice of surgical approach and the formulation of postoperative rehabilitation plans.Furthermore, the accuracy in assessing associated soft tissue injuries is another key focus of this study. The extent of soft tissue damage often affects the healing speed of the fracture and the patient's functional recovery[4]. Lastly, this study emphasizes the accuracy of differential diagnosis, particularly distinguishing fractures from conditions such as localized soft tissue contusions, ligament injuries, and joint dislocations. This is a critical step to ensure precise diagnoses and to avoid misdiagnosis .

3. Results Analysis

3.1 Analysis of Fracture Detection and Diagnostic Accuracy

By comparing the diagnostic effectiveness of different imaging methods, differences in fracture detection rates and diagnostic accuracy

were observed. The specific data are presented in the table 1 below :

Table 1 .data sheet

Imaging Method	Number of Examinations	Number of Fractures Detected	Detection Rate	Missed Diagnosis Rate	Fracture Type Diagnostic Accuracy	Fracture Site Diagnostic Accuracy
X-ray	500	450	90%	10%	85%	90%
CT	150	150	100%	0%	95%	98%
MRI	100	100	100%	0%	98%	100%

The data from the table indicate that X-ray films achieved a fracture detection rate of 90%, but with a 10% missed diagnosis rate. The diagnostic accuracy for fracture type and location was 85% and 90% respectively, relatively lower. This may be related to the imaging principles of X-ray, which may not be sensitive enough to detect certain subtle fracture lines or bone fragments. In contrast, both CT and MRI achieved a 100% fracture detection rate with no missed diagnoses. The diagnostic accuracy for fracture type and location was also significantly higher than X-ray films, especially for MRI, reaching 98% and 100% respectively. This is attributed to the high resolution and multi-dimensional imaging capabilities of CT and MRI, allowing for clearer display of fracture details.

3.2 Analysis of Soft Tissue Injury Assessment Accuracy

Among the 100 patients who underwent MRI examinations, soft tissue injuries were successfully detected in 80 cases, achieving an assessment accuracy of 80%. This result indicates that MRI exhibits a high level of accuracy in evaluating soft tissue injuries. The multi-sequence imaging capability of MRI allows for clear visualization of soft tissue structures, including muscles, tendons, and ligaments, thereby accurately assessing the extent of soft tissue damage.

3.3 Analysis of Differential Diagnosis Accuracy

The following accuracy results were achieved in the differential diagnosis of localized soft tissue contusions, ligament injuries, and joint dislocations below in the table 2 below :

Table 2 . results data sheet

Differential Disease	Number of Cases	Correct Diagnosis	Accuracy
Localized Soft Tissue Contusions	100	90	90%
Ligament Injuries	50	45	90%
Joint Dislocations	20	18	90%

From the data in the table, it is evident that we achieved high accuracy in the differential diagnosis of localized soft tissue contusions, ligament injuries, and joint dislocations, all reaching 90%. This result indicates that through a combination of imaging findings and physical examinations, we can effectively distinguish these similar conditions, ensuring diagnostic accuracy.

In summary, various imaging methods have their own advantages in the diagnosis of traumatic fractures. X-ray films are suitable for initial screening and rapid diagnosis; CT provides more accurate localization of complex fractures and bone fragments; while MRI has unique advantages in evaluating soft tissue injuries. In terms of differential diagnosis, through comprehensive evaluation of imaging findings and physical examinations, we can effectively differentiate similar diseases, thus improving diagnostic accuracy.

4. Discussion

This study extensively explored the specific applications of X-ray, CT, and MRI in the diagnosis of traumatic fractures, and concluded that the comprehensive use of these imaging methods can significantly improve the detection rate and diagnostic accuracy of fractures. X-ray films, as a long-standing and widely used diagnostic tool, play an important role in the initial screening of traumatic fractures. Its advantages lie in its simplicity of operation, low cost, and fast imaging speed. For most obvious fractures, X-ray films can provide clear images of fracture lines. However, its limitations are also evident, especially in detecting subtle or complex fractures where its detection capability may be relatively limited.In comparison to X-ray films, CT and MRI demonstrate higher efficiency in the detection and diagnosis of fractures.

The multi-dimensional reconstruction capability of CT enables precise localization of bone fragments and fracture lines, and can even detect occult fractures obscured by surrounding structures. MRI, with its excellent soft tissue resolution, stands out in evaluating associated soft tissue injuries, which is crucial for comprehensive fracture assessment and treatment planning.In the aspect of differential diagnosis, this study also achieved significant results. Through detailed imaging findings and physical examinations, the study successfully differentiated diseases with symptoms similar to traumatic fractures, such as localized soft tissue contusions, ligament injuries, and joint dislocations.However, this study still has certain limitations. Although the sample size has reached a certain scale, in order to comprehensively validate the reliability of the conclusions, future studies could further expand the sample range. Additionally, with the continuous advancement of medical imaging technology, future research can explore the potential and application value of emerging imaging technologies such as ultrasound bone density measurement and nuclear bone imaging in the diagnosis of traumatic fractures. The introduction of these technologies is expected to further enhance the accuracy and efficiency of diagnosis, thereby better serving patients.

Conclusion

Through detailed analysis and discussion of X-ray, CT, and MRI in the diagnosis of traumatic fractures, this study recognizes the importance of integrating multiple imaging methods to improve fracture detection rates and diagnostic accuracy. Each method has its own advantages, complementing each other, and providing clinicians with more comprehensive and accurate diagnostic basis. Additionally, it is also realized that comprehensive evaluation of imaging findings and physical examinations is equally important in differential diagnosis, aiding in more precise identification and treatment of patients. Despite achieving certain results in this study, continuous exploration and improvement are still necessary to provide better services for patients in future clinical practice. It is hoped that through ongoing research and practice, the diagnostic level of traumatic fractures can be further enhanced, leading to better treatment outcomes and quality of life for patients.

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Study on the effect of different doses of Ermiaosan on inflammatory response in CIA model rats

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Abstract: Objective: To investigate the effect of different doses of Ermiaosan on improving the inflammatory response in collagen-induced arthritis (CIA) model rats. Methods: The CIA rat model was established and randomly divided into the model group (CIA group), and low, medium, and high dose Ermiaosan groups. Each group was treated with the corresponding drugs, while the healthy control group and the model group were given an equal volume of saline by gavage. The expression of inflammatory factors IL-1β, IL-6, and TNF-α in each group was detected using ELISA, and the pathological changes in rat joints were observed using Masson staining. Results: Rats in the CIA group showed significant tissue damage, tissue proliferation, and inflammatory infiltration in the joints. The low, medium, and high dose Ermiaosan groups exhibited reduced joint tissue destruction and proliferation. Different doses of Ermiaosan were able to alleviate joint lesions in CIA rats. The expression levels of IL-1β, IL-6, and TNF-α in serum were significantly reduced in all dose groups ($P<0.05$). Compared with the CIA group, the medium and high dose groups showed consistent therapeutic effects, both significantly better than the low dose group. Conclusion: The medium dose of Ermiaosan achieved satisfactory therapeutic effects on the inflammatory response in CIA model rats. Ermiaosan may exert its therapeutic effects on RA by inhibiting inflammatory factors.

Keywords: Ermiaosan; Rheumatoid Arthritis; CIA Model Rats

1. Introduction

Rheumatoid arthritis (RA) is an autoimmune disease characterized by persistent synovitis and progressive bone destruction in multiple joints. Common symptoms include joint swelling, pain, stiffness, deformity, and severe functional impairment. However, the pathogenesis of RA remains unclear[1]. According to incomplete statistics, the global incidence rate is 0.1-1% of the population, with the incidence in China ranging from 0.32% to 0.36%[2]. Due to the difficulty in controlling its pathological process, high disability rate, and significant impact on patients' physical and mental health and quality of life, RA has become one of the challenging diseases in the medical field. Ermiaosan, composed of Atractylodes lancea and Phellodendron amurense, was first recorded as Cangzhu Powder in "Shiyi Dexiao Fang" by Wei Yilin in the Yuan Dynasty and later renamed Ermiaosan in "Danxi Xinfa" by Zhu Zhenheng. Ermiaosan has the effect of clearing heat and drying dampness, primarily treating damp-heat syndrome, muscle and bone pain, and weakness of the legs and knees, as well as red, swollen, and painful feet and knees. It is a classic prescription for treating damp-heat syndrome. Modern pharmacology has confirmed that Ermiaosan can effectively treat rheumatoid arthritis and acute gout[3-5]. According to the dosage instructions for Ermiaowan, the recommended dosage is 6-9g per dose, taken twice daily. In contrast, "Danxi Xinfa" prescribes 3-5g per dose, taken three times daily. Given the same disease and medication, the dosage recommendations differ. This study aims to explore the optimal dosage by investigating the effects of different doses of Ermiaosan on improving the inflammatory response in collagen-induced arthritis (CIA) model rats.

2. Materials and methods

2.1 Animals

Forty male DBA/1 mice (SPF grade, weight 18-20g) were purchased from Shanghai Slack Laboratory Animal Co., Ltd.

2.2 Preparation of Ermiaosan decoction

For the preparation of Ermiaosan decoction, 100g of Phellodendron amurense and 100g of Atractylodes lancea were soaked in 2000ml of distilled water and boiled for 1 hour. The mixture was filtered and reserved. The residue was then boiled again in 1000ml of distilled water

for 30 minutes, and the filtrates from both boils were combined. The combined filtrate was then heated and concentrated to a final concentration of 1g·ml-1 for use.

3. Methods

3.1 Animal model, grouping, and sample collection

Forty Wistar female rats were used. Ten rats were assigned to the healthy control group, while the remaining thirty rats were subjected to CIA modeling. The initial immunization involved subcutaneous injections at multiple sites with bovine type II collagen at a concentration of 1mg/ml. One week later, a booster immunization was performed with intraperitoneal injections of bovine type II collagen at a concentration of 1mg/ml (0.3ml per rat). The healthy control group received an equal volume of saline subcutaneously at multiple sites during the initial immunization and intraperitoneally one week later.

After successful modeling, the rats were randomly divided into five groups using a random number method: CIA model group (CIA), low-dose Ermiaosan group (1ml of Ermiaosan decoction), medium-dose Ermiaosan group (2ml of Ermiaosan decoction), and high-dose Ermiaosan group (3ml of Ermiaosan decoction). The healthy control and CIA model groups received saline gavage. All treatments were administered daily for 4 weeks.

3.2 Detection of inflammatory cytokines in rat serum by elisa

ELISA was performed according to the kit's instructions. Blank control wells, standard wells, and sample wells were set up, with each test containing three replicate wells and 100μl of sample per well. After gentle shaking, 50μl of enzyme-labeled solution was added to each well, and the plate was incubated at 37°C for 1 hour. The liquid was discarded, and the wells were washed five times. After drying, 50μl each of DAB coloring solutions A and B were added to each well and incubated at 37°C in the dark for 10-15 minutes. Then, 50μl of stop solution was added to each well. Absorbance (A) at 450nm was measured. The experiment was repeated three times.

3.3 Masson staining to observe pathological changes in rat joints

The skin and muscle tissue attached to the surface of the hind joints of the rats in each experimental group were trimmed and decalcified using EDTA. The tissues were then embedded in paraffin and sectioned. The sections were stained with hematoxylin for 10 minutes, rinsed for 1 minute, and then allowed to stand for 5 minutes. They were stained with Ponceau S for 7 minutes, rinsed with 2% acetic acid solution for 5 seconds, differentiated with 1% phosphomolybdic acid solution for 10 minutes, and stained with aniline blue solution for 5 minutes. Finally, the sections were rinsed with 2% acetic acid solution for 5 seconds and observed under a light microscope.

3.4 Statistical Analysis

Experimental data were analyzed using SPSS 24.0 software. One-way ANOVA followed by pairwise comparisons (Tukey test) was performed to analyze differences between groups. Results were expressed as mean ± standard deviation ($\bar{x} \pm s$), and a P value <0.05 was considered statistically significant.

4. Result

4.1 Impact of Ermiaosan on joint pathological features in different experimental groups

Masson staining results showed that, compared to the healthy group, the CIA group exhibited significant inflammatory infiltration and characteristic arthritic changes such as tissue damage and proliferation in the joints. In the different dosage groups of EMS, joint destruction and tissue proliferation were reduced. The middle and high dosage groups showed more noticeable therapeutic effects on arthritis features and tissue proliferation compared to the low dosage group. This indicates that the CIA rat model was successfully established in this experiment, and the optimal therapeutic concentration of EMS for treating CIA rats is the medium dosage.

4.2 Impact of Ermiaosan on the expression of inflammatory cytokines in different experimental groups

The differences in the levels of inflammatory cytokines in the serum of rats from different experimental groups were statistically significant ($P<0.01$). Compared to the healthy group, the levels of IL-1β, IL-6, and TNF-α in the serum of the CIA group were significantly elevated ($P<0.01$). Compared to the CIA group, the expression of IL-1β, IL-6, and TNF-α in the serum of rats from the different dosage groups was significantly reduced ($P<0.05$). The levels of IL-1β and TNF-α in the low dosage group were significantly lower than those in the middle and high dosage groups ($P<0.05$, $P<0.01$), while the difference in IL-6 levels was not statistically significant ($P>0.05$).

Conclusion

RA is a disease for which traditional Chinese medicine offers significant therapeutic advantages, and Ermiaosan has been widely used in its clinical treatment. The CIA rat model is a classic and currently recognized as one of the best models for studying RA, especially in research related to treatment mechanisms and immune responses[6-7]. This study confirms that Ermiaosan at various doses can alleviate joint lesions in CIA rats. Compared to the CIA group, both the medium and high-dose groups demonstrated consistent therapeutic effects, with more pronounced results than the low-dose group. The levels of inflammatory factors IL-1β, IL-6, and TNF-α in the rats' serum were significantly reduced, suggesting that Ermiaosan may exert its therapeutic effects on RA by inhibiting the expression of these inflammatory factors.

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The value of CRP and NLR in differential diagnosis of benign and malignant pulmonary nodules

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Abstract: Objective: Evaluate CRP and NLR levels in benign vs. malignant pulmonary nodules for differential diagnosis. Methods: Selected 60 patients with benign nodules and 60 with lung cancer from a Hunan hospital from August 2022 to December 2023. Analyzed CRP and NLR diagnostic value. Results: Significant differences in CRP, NLR levels between groups (P<0.05). Conclusion: CRP and NLR levels are higher in lung cancer patients, indicating diagnostic value in distinguishing benign vs. malignant nodules.

Keywords: CRP; NLR; Pulmonary Nodules; Lung Cancer; Differential Diagnosis

Introduction

Pulmonary nodules are circular or irregular lesions <3cm in diameter in the lung, with single or multiple occurrences and clear or unclear borders，Imaging manifestations are shadows of increased density[1]. Since the outbreak of COVID-19, lung CT exams have become routine, resulting in increased detection of lung nodules. Studies[2] show that 90% of nodules detected by LDCT are benign, while 10% are malignant. The increasing detection rate impacts patients' physical and mental health and leads to more unnecessary invasive procedures. Hence, emphasis should be placed on the differential diagnosis of nodules and reducing invasive operations for benign ones.

Chronic inflammation plays a crucial role in cancer occurrence, development, and prognosis[3], involving interactions among immune cells, inflammatory cells, cytokines, and pro-inflammatory factors. Neutrophils, for instance, bind to cytokines to promote carcinogenesis and cancer progression[4]. Meta-analyses reveal that elevated NLR levels in malignancies, including lung cancer, correlate with lower patient survival[5]. CRP, a pentamer protein secreted by inflammatory cells, significantly increases during injury, infection, and malignancy. This study explores the diagnostic value of CRP and NLR in distinguishing between benign and malignant pulmonary nodules.

1. Data and methods

1.1 General data study: Patients who underwent lung CT in a Grade-III hospital in Hunan Province from August 2022 to December 2023 and showed pulmonary nodules were selected. All patients underwent percutaneous pulmonary puncture biopsy, electronic fiberbronchoscopy, or surgical pathological examination. The study included 60 patients with confirmed lung cancer and 60 with benign pulmonary nodules.Gender distribution: 76 males, 44 females. Lung cancer patients: 39 males, 21 females. Benign group: 37 males, 23 females. Average age: 59.9±10.422 years old overall, 63.51±7.741 in lung cancer, 56.27±11.459 in benign.Inclusion criteria: ① CT showed ≤3cm circular/quasi-circular lung lesions; ② Definite pathological diagnosis; ③ No history of infectious disease, blood transfusion; ④ No treatment for small pulmonary nodules. Exclusion criteria: ① Hepatic/renal dysfunction; ② Tumor history; ③ Medical conditions affecting serum FLC & inflammatory markers (e.g., connective tissue diseases, COPD, diabetes, infections); ④ Mental disorders, language barriers, communication issues.

1.2 Methods: Collected clinical data included name, gender, age, blood routine, CRP, imaging, and pathological data. NLR was calculated using blood routine indicators as NLR = neutrophil count/lymphocyte count.

1.3 Observation indicators: CRP and NLR levels were compared and analyzed between the two groups, and their statistical significance indicated differential diagnosis value.

1.4 SPSS26.0 was used for statistical analysis. Measurement data were normally distributed and expressed as (x ±s). Independent sample t test was used for group comparison. $\chi 2$ test or continuously adjusted $\chi 2$ test was used for statistical comparison, with P≤0.05 considered statistically significant.

2. Results Comparison of CRP and NLR levels between patient groups found that CRP and NLR levels in the lung cancer group were higher than those in the benign group, and the differences in CRP and NLR levels between the two groups were statistically significant (P<0.05), as shown in Table 1.

Table 1. Comparison of CRP and NLR Levels between Groups

Subjects	Benign group	Lung cancer group	t	P
CRP	4.87±7.62	29.68±45.39	-4.210	<0.01
NLR	2.94±1.38	4.57±3.18	-3.679	<0.01

3. Discussion

CT imaging has led to increased detection of lung nodules, primarily due to the focus on pulmonary malignant tumors. While only 10% of lung nodules detected by LDCT are cancerous, the high incidence and mortality of lung cancer in China remain significant due to population size, age structure, and lifestyle changes. Most patients are diagnosed with advanced disease, limiting treatment options and often leading to unsatisfactory outcomes. This imposes mental pressure on patients and strains the medical system. Hence, emphasizing early detection, diagnosis, and treatment of lung cancer is crucial.

Chronic inflammation is a key factor in cancer occurrence, development, and prognosis[6]. Peripheral blood inflammatory markers, including C-reactive protein (CRP) and neutrophil-to-lymphocyte ratio (NLR), reflect inflammation, immunity, and tumor relationships[7]. These markers are noninvasive, convenient, economical, and repeatable, aiding early lung cancer diagnosis and prognosis. This study found elevated CRP and NLR levels in lung cancer patients vs. benign group ($P < 0.05$), consistent with previous research linking CRP to lung cancer risk[8]. Indicators for early lung cancer detection significantly improved sensitivity and specificity, making them valuable for diagnosis[9]. Li-xia Yuan[10] et al. found CRP related to lung cancer classification, staging, and lymph node metastasis, possibly due to weakened immune states promoting tumor progression and affecting prognosis. With the rise of immune therapy, the tumor microenvironment has gained attention. Neutrophils, lymphocytes, and platelets are key components, with neutrophils promoting tumor-related inflammation and restraining lymphocyte activity, while lymphocytes induce cytotoxicity, leading to cell death and inhibiting tumor cell growth and metastasis. Therefore, Higher NLR leads to systemic inflammatory reaction, immune imbalance, and imbalance in cancer and anti-cancer roles [11]. Zhu Xuhua et al. [12] found that lung cancer patients have significantly elevated NLR levels compared to healthy individuals, indicating its predictive value in lung cancer diagnosis.

In summary, CRP and NLR possess significant clinical application value in the differential diagnosis of pulmonary nodules, making them worthwhile candidates for widespread utilization in clinical practice.

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Universe Scientific Publishing

Application Comparison of Different Tip Positions of Midline Catheters in Neurosurgical Patients

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Abstract: Objective To compare the clinical effect of midline catheter tip in different locations. Methods The 205 patients admitted to the neurosurgery department were divided into 105 patients in the catheter of the test group and 100 patients in the control group,the catheter tip of the test group located in the subclavian vein and the catheter tip of the control group in the axillary vein of the chest. Results There was no statistical difference in the catheter retention time and complications and the control group (P> 0.05). Conclusion The tip of the midline catheter is located in the subclavian vein and the axillary vein of the chest.

Keywords: Midline Catheter; Neurosurgical Patients; Complications; Indwelling Time

1. Introduction

Midline catheter (middle catheter, MC), also known as medium length catheter or medium length catheter, is a kind of upper limb expensive vein, head vein, median cubital vein and brachial vein inserted peripheral intravenous infusion tools, catheter tip can reach subclavian vein, puncture speed, high success rate, safety, low maintenance cost advantages, widely used in clinical[1], for severe patients provides an economic and safe intravenous infusion[2]. However, the optimal location and indwelling time of the MC tip are still controversial. The 2021 INS guideline[3] states that the MC tip should be retained at the axillary level for less than 2 weeks; 2021[4] recommends that the MC tip should be located in the axillary vein of the chest or the subclavian vein for months in the chest wall and[5] also recommends the MC tip in the thoracic axillary vein of the chest or the subclavian vein for 4 weeks. Neurologically severe patients[6] intermittent use of antibiotics, dehydrating agents, vasoactive drugs, electrolytes, intravenous nutrient solution and other irritating drugs to the blood vessels. The use of MC can reduce the stimulation of blood vessels by drugs and avoid the occurrence of potential complications[7]. A study[8] indicates that the MC tip is not positioned, which can cause multiple complications. By comparing the effects of different tip positions in neurosevere patients, this study can determine the location of the optimal tip, clarify its relationship with complications and indwelling time, and provide decision support for clinical placement nurses.

2. Materials and Methods

2.1 subject investigated

Patients admitted to the neurosurgery department,Inclusion criteria: (1) the expected time of intravenous infusion ≥1 week; (2) ≥14 years; (3) normal blood routine and coagulation function; (4) the patient or guardian approved the midline catheter and signed the informed consent; (5) the nature of the intravenous infusion met the indications of MC. Exclusion criteria: (1) infectious source at the catheterization site, history of thrombosis, trauma or vascular surgery; (2) combined immune system and hematopoietic dysfunction; (3) multiple organ damage, or severe dysfunction of other organs. The criteria were excluded (1) patients who were voluntarily discharged during catheter detention due to special conditions such as changes of condition; (2) patients who were transferred to hospital with tube. Computer generated random numbers were used into the test group (the catheter tip in the subclavian vein) and the control group (the catheter tip in the axillary vein of the chest).

2.2 Methods

In both groups, the supine position was taken and MC catheterization was performed in the ultrasound-guided modified Ceedinger technique in the optimal puncture region (ZIM), the middle of the upper arm. Evaluation the patient's skin and upper limbs before catheterization, explore the vessels in the upper arm ZIM area using an ultrasound system to strictly distinguish the arterial vein and avoid accidental

injury to the arteries. Test group: Measure the distance from the pre-puncture point to the subclavian vein, that is, the distance between the pre-puncture point along the vein to the ipsilateral thoracic clavicular joint minus 2cm is the catheter insertion length. Control group: measure the distance between the pre-puncture point and the axillary vein of the chest of the chest, that is, the distance between the pre-puncture point along the vein and the ipsilateral minus 3-4cm minus the length of the catheter.

2.3 Observing indicators

Catheter-related complications included Unplanned extubation, Catheter occlusion, Catheter dislodgement, Phlebitis, Catheter-related infection,Bleeding,Infiltration. The catheter is the days between the day of catheter placement and the day of extubation.

2.4 Quality control

All patients used a split three-way valve silicone catheter of the same brand and the same batch number, with a total length of 30cm. The catheter can be pruned spontaneously. All were performed by intravenous infusion specialist nurses with more than 3 years of experience in midline catheter catheterization. Unified training is also conducted to ensure the consistent catheter exposure length, catheterization and maintenance process. Unified trained researchers will collect relevant data and input the data into a dedicated electronic database.

2.5 Statistical methods

The data were analyzed and processed by SPSS26.0 software, count data were expressed by percentage and $\chi 2$ test; measurement data meeting the normal distribution were expressed by（±S）, and two independent sample t-test with $P < 0.05$.

3. Results

3.1General data between the two groups are compared,Table 1.

Table 1 Comparison of general data

item	experimental group（n=105)	control group（n=100）	statistical method	P-value
Age (year)	56.35±12.50	58.58±10.24	t=1.441	0.151
Gender（%）			$\chi 2$=0.1853	0.667
Male	64	58		
Female	41	42		
GCS	9.06±1.74	8.68±1.47	t=1.740	0.083
Disease type			$\chi 2$=2.744	0.254
Blood vessel of brain	57	44		
Brain trauma	22	30		
Brain tumor	17	16		
Others	9	10		
Position（%）			$\chi 2$=0.228	0.633
LUA	49	50		
RUA	56	50		
vein（%）			$\chi 2$=0.272	0.099
basilic vein	65	70		
brachial vein	45	30		

3.2 Comparison of catheter complications at different tip locations,Table 2.

Table 2 Comparison of catheter-related complications

item	experimental group（105）	control group（100）	$\chi 2$	P-value
Total complications	8	11	0.696	0.404
Unplanned extubation	2	3		

Catheter occlusion	1	2		
Catheter dislodgement	4	6		
Phlebitis	1	0		
Catheter-related infection	0	0		
Bleeding	0	0		
Infiltration	0	0		

3.3 Comparison of catheter indwelling time in the two patient groups,Table 3.

Table 3: Comparison of the indwelling time

item	indwelling time(d)	t	P-value
experimental group(105)	22.50±8.03	1.282	0.201
control group(100)	23.75±6.28		

4. Discussion

4.1The complication rate is low when the midline catheter tip is located in the subclavian vein

Zhao[9] suggested that the location of the MC tip in different veins may affect the safety of catheter use. According to Adams[10], the optimal position of the MC tip is the axillary vein and above. The results of this study showed that the overall incidence of catheter-related complications in the catheter tip was lower than with the catheter tip in the axillary vein. The blood flow rate of the head vein, the expensive vein or the axillary vein is 100 ~ 150 ml/min, while the blood flow rate of the axillary vein and the subclavian vein is 30 ml/min. The faster blood flow rate can quickly dilute the drug and reduce the stimulation of the vascular intima, thus reducing the incidence of chemical phlebitis and catheter-related thrombosis. Prasanna [11]suggested that patients with a catheter tip located in the axillary vein had a significantly higher incidence of catheter-associated thrombosis compared to the subclavian vein. Domestic scholars have found that the location of the MC tip above the axillary vein will significantly increase the risk of thrombosis[12,13], and the location of the midline catheter tip in the subclavian vein can reduce the incidence of catheter-related complications and prolong the indwelling time[14].

4.2The midline catheter was retained longer when the tip was located in the subclavian vein

Zhao[15]found that when the tip of the catheter was located in the subclavian vein, the rate of catheter-related complications was lower, the retention time was longer, and the clinical effect was better. During antimicrobial therapy with a midline catheter, the catheter tip was located in the subclavian vein, with a lower rate of catheter-related complications and a longer retention time of[16]. Catheter-related complications can affect the catheter use and indwelling time [17]. The results of this study showed that when the MC tip was in the subclavian vein, the catheter retention time was longer. Study[18] reported that the extubation rate of MC was 31.63% due to complications, and the main cause of extubation was catheter blockage. However, in this study, extubation was mainly due to unplanned extubation with consciousness disorder, suggesting that patients with consciousness disorder pay attention to restrain hands. When the MC tip is located in the subclavian vein, the catheter retention time can be prolonged by reducing the catheter-related complications.

5. Conclusion

There was no difference in the overall incidence and indwelling time when the MC tip was in the subclavian and axillary vein of the chests, and future studies could further explore the effect of MC retention time> 4 weeks on the incidence of catheter-related complications.

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