Study on the Diagnostic Effect of Serum Tumor Marker Detection on Benign and Malignant Pelvic Tumors

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Abstract: *Objective:* To analyze the diagnostic effect of serum tumor marker detection for benign and malignant pelvic tumors. *Methods:* A total of 90 subjects, including healthy individuals and patients with benign and malignant pelvic tumors, were selected for research from April 2021 to July 2022. Two milliliters of venous blood were drawn on an empty stomach in the early morning. The serum was separated and processed within 2 hours, and then microparticle chemiluminescence was used to detect various serum tumor markers, including carcinoembryonic antigen (CEA), alpha-fetoprotein (AFP), carbohydrate antigen 125 (CA- 125), and carbohydrate antigen 19-9 (CA19-9). *Results:* Through testing of the observation and control groups, it was found that patients with pelvic tumors had significantly higher CA-125 and CA19-9 ($P < 0.05$). Additionally, CA-125 and CA19-9 in patients with malignant tumors were significantly higher than those in benign patients ($P < 0.05$). The correlation between CEA and AFP and pelvic tumor is low, while CA-125 and CA19-93 are positively correlated with the severity of the disease. *Conclusion:* Multiple serum tumor marker detection demonstrated a higher value for diagnosing benign and malignant pelvic tumors and can improve the sensitivity and specificity of single marker detection. Analysis of CA-125 and CA19-9 levels accurately distinguishes between benign and malignant pelvic tumors, as well as provides data support for clinical treatment.

Keywords: Pelvic benign and malignant tumors; Serum tumor markers; Diagnostic effect

1. Introduction

Pelvic benign and malignant tumors encompass a group of tumors affecting various organs such as the ovary, uterus, cervix, and others. Their occurrence and progression entail intricate biological processes and involve multiple anatomical structures. Based on their nature, pelvic tumors are categorized into two types: benign and malignant. Benign tumors typically exhibit non-invasive characteristics and pose relatively lower threats to the patient's life. However, they may still induce symptoms, and functional impairment, and carry a risk of malignant transformation. Common examples include ovarian cysts and uterine fibroids. In contrast, malignant tumors are highly invasive and metastatic, posing significant threats to both survival rate and quality of life.

Examples include ovarian cancer, cervical cancer, and endometrial cancer.

Benign tumors usually arise from abnormal proliferation of normal cells, exhibiting slow growth with well-defined borders [1]. Conversely, malignant tumors often stem from genetic mutations, leading to uncontrolled cell division and invasiveness. The pathogenesis involves various factors such as genetics, environment, and hormones, adding complexity to clinical treatment. However, the symptoms of both benign and malignant tumors are typically mild in the early stages of the disease, lacking typical manifestations. Clinical presentations may include pelvic pain, abnormal vaginal bleeding, and frequent urination, which may not prompt immediate concern from patients. Therefore, early diagnosis becomes imperative to enhance treatment success rates.

Serum tumor markers represent biomolecules measured in patients' bodily fluids, and alterations in their presence or levels can indicate the presence of tumors [2]. This study primarily investigates the diagnostic efficacy of serum tumor marker detection for benign and malignant pelvic tumors. To achieve this, a total of 90 subjects, including healthy individuals and those with benign and malignant pelvic tumors, were selected for research between April 2021 and July 2022.

2. Materials and methods

2.1. General information

The study was conducted between April 2021 and July 2022, encompassing a total of 90 patients. Among these, 40 were healthy subjects, and 50 had pelvic tumors, comprising 31 benign cases and 19 malignant cases. The control group (healthy subjects) underwent routine physical examinations, aged between 24 and 72 years old, with an average age of 45.93 ± 4.22 years old. The observation group (pelvic tumor patients) ranged in age from 25 to 71 years, with an average age of 45.06 ± 4.37 years. Inclusion criteria were as follows: (1) Consent provided by all participants; (2) Availability of complete clinical data and relatively accurate ultrasound and pathological examination results; (3) Diagnosis of patients in the observation group confirmed through comprehensive methods such as clinical imaging. Exclusion criteria included: (1) Coexistence with other malignant tumors; (2) Presence of multiple organ dysfunction; (3) Patients with mental disorders impeding independent communication; (4) Instability of condition among patients in the observation group.

2.2. Methods

All participants provided 2 mL of venous blood in the early morning on an empty stomach, with serum separated within 2 hours. Microparticle chemiluminescence was employed to detect various serum tumor markers, including carcinoembryonic antigen (CEA), alpha-fetoprotein (AFP), carbohydrate antigen 125 (CA-125), and carbohydrate antigen 19-9 (CA19-9).

2.3. Observation indicators

(1) Analysis of differences in serum tumor markers between healthy individuals undergoing physical examinations and patients with pelvic tumors.
(2) Analysis of various serum tumor markers in malignant and benign patients.
(3) Observation of the relationship between various serum tumor markers and diseases.

2.4. Statistical analysis

Data analysis was performed using SPSS 23.0 software. Differences between groups were compared using t-tests and χ^2 tests, with P-values analyzed to explore intergroup differences. A P-value of < 0.05 was considered statistically significant.

3. Results

3.1. Serum tumor marker levels of both groups

Table 1 shows that patients with pelvic tumors had significantly higher CA-125 and CA19-9 levels ($P < 0.05$).

Table 1. Serum tumor marker levels of both groups

Group	CEA (ng/mL)	AFP (ng/mL)	CA-125 (U/mL)	CA19-9 (U/mL)
Observation group ($n = 50$)	1.76 ± 0.62	3.42 ± 0.35	237.44 ± 40.31	106.53 ± 41.99
Control group ($n = 40$)	1.52 ± 0.64	3.31 ± 0.32	14.18 ± 1.14	12.01 ± 1.14
t	1.799	1.539	34.978	14.216
P	> 0.05	> 0.05	< 0.05	< 0.05

3.2. Serum tumor marker levels in patients with malignant and benign tumors

As shown in **Table 2**, CA-125 and CA19-9 in patients with malignant tumors were significantly higher than those in benign patients ($P < 0.05$).

Table 2. Serum tumor marker levels in patients with malignant and benign tumors

Group	CEA (ng/mL)	AFP (ng/mL)	CA-125 (U/mL)	CA19-9 (U/mL)
Malignant patients ($n = 19$)	1.81 ± 0.70	3.45 ± 0.37	421.57 ± 60.26	159.62 ± 50.88
Benign patients ($n = 31$)	1.62 ± 0.58	3.39 ± 0.33	59.88 ± 20.11	48.92 ± 16.71
t	1.039	0.596	34.978	11.227
P	> 0.05	> 0.05	< 0.05	< 0.05

3.3. Relationship between serum tumor marker levels and disease conditions

Research has concluded that CEA and AFP have a low correlation with benign and malignant diseases, while CA-125 and CA19-93 positively correlate with the disease – higher levels of CA-125 and CA19-93 indicate a more severe disease (**Table 3**).

Table 3. Correlation analysis of serum tumor marker levels

Indicator	γ	P
CEA	0.071	> 0.05
AFP	0.014	> 0.05
CA-125	0.826	< 0.05
CA19-9	0.875	< 0.05

4. Discussion

Pelvic gynecological tumors can be categorized as benign or malignant, with the most common malignancies including ovarian cancer, cervical cancer, and endometrial cancer, which pose significant threats to female patients' lives. Therefore, adhering to the principles of early diagnosis and treatment is imperative to effectively control disease progression, enhance patient prognosis, and extend survival time. While benign pelvic tumors may not have as severe impacts on women's daily lives, they still hold potential health implications and carry a risk of malignant transformation if left untreated. Consequently, clinical research efforts focus on distinguishing

between benign and malignant pelvic tumors to provide a scientific foundation for clinical interventions [3].

Tumor markers, synthesized by tumor cell gene expression during tumor occurrence and proliferation, serve as active substances reflecting tumor presence and growth. These markers, which can be proteins, carbohydrates, nucleic acids, etc., originate from either tumor cells themselves or as responses to the tumor growth environment. Clinical practice encompasses various types of serum tumor markers, categorized by properties and sources such as protein markers and carbohydrate markers [4]. In this study, CEA, AFP, CA-125, and CA19-9 were selected for observation.

CA-125, a high molecular weight glycoprotein, primarily originates from embryonic cells and ovarian epithelial cells, with significantly increased production in ovarian cancer lesions. However, it is noteworthy that CA-125 detection alone is not specific to ovarian cells and may be detected in tissues and diseases beyond the pelvic cavity, including endometriosis, uterine fibroids, and breast cancer [5]. Yet, elevated levels of CA-125 are often related to the extent and progression of pelvic tumors. CA19-9, a glycoprotein antigen composed of polysaccharide chains and protein parts [6], originates from various tissues such as the pancreas, stomach, large intestine, uterus, etc., and involves cell-cell adhesion and antibody-mediated immune response in the body. CA19-9 flows into the blood in large quantities and increases abnormally in the presence of tumor cells, and its level is positively correlated with the disease development and malignancy degree. AFP is a protein produced in the placenta and liver during fetal life [7]. Clinical studies found that the level of AFP is normally low in healthy adults and is commonly present in liver cells [8]. It has a high value for cancer detection, and the increase in its level is closely related to the existence and severity of hepatocellular carcinoma. However, in pelvic tumors, its increase is not obvious, hence AFP detection alone cannot effectively detect pelvic tumors [9]. CEA is an adhesion molecule that belongs to the glycoprotein family and is mainly distributed in tissues such as the pancreas, colon, and stomach. Diseases such as colon cancer, lung cancer, and breast cancer all cause an increase in CEA. However, due to the high specificity of this indicator, it may also increase in some non-cancer patients, such as the elderly and smokers. Therefore, CEA is not clinically used as a cancer screening indicator but can be used as an observation indicator for postoperative patient recovery [10].

The study results revealed significant differences in CA-125 and CA19-9 levels between the observation and control groups, with higher levels observed in malignant tumor patients. CA-125 and CA19-9 levels positively correlated with disease severity, confirming their relevance in distinguishing between benign and malignant pelvic tumors. While CEA and AFP showed lower specificity, their combined analysis contributes to assessing treatment effects in clinical settings. Early diagnosis is crucial in pelvic tumor management, and serum tumor marker detection plays a pivotal role in early cancer screening and treatment monitoring. The success rate of treatment and the increase of CA-125 and CA19-9 are clues for the early detection of pelvic tumors [11]. Regular monitoring of specific marker levels facilitates accurate assessment of patients' survival and disease progression, providing essential insights for personalized treatment strategies [12].

In summary, the detection of multiple serum tumor markers holds significant value in detecting benign and malignant pelvic tumors, enhancing sensitivity and specificity compared to single marker detection. Analysis of CA-125 and CA19-9 levels facilitates accurate disease differentiation and provides essential data support for clinical treatment.

Disclosure statement

The author declares no conflict.

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