Methods of formation of the knowledge base in the diagnosis of melanoma

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Abstract. The method of building of information systems for the diagnosis of skin melanoma is described in the presented work. Malignant tumors at the level of macro- and microimages in combination with clinical data are investigated. The development is made with the use of MySQL. An information system is a result of joint activities of the National research nuclear University "MEPhI" (Moscow Engineering Physics Institute) with N. N. Blokhin Russian Cancer Scientific Center.

1. Introduction

Skin melanoma is one of the most malignant tumor that are developed from melanocytes and melanoblast. According to the world health organization melanoma is about 4% in the general structure of all skin diseases. Melanoma is about 10% of all forms of skin cancer. 90% of the deaths attributable to malignant tumors of the skin caused by skin melanoma. Over the past 10 years a steady increase in the incidence of melanoma of the skin in all regions of the world are noted by many researchers. Thus, in most countries of the world the incidence doubles every 5 - 10 years. Diagnosis and treatment of melanoma still remain a complex problem of cancer. By the beginning of the treatment, as a rule, 75% of patients already have a regional common process, and a five-year survival does not exceed 50%.

According to the International Agency for Research on Cancer (IARC), primary skin melanoma may develop on the background of a preceding melanocytic naevus in 28-50% of cases. That is why early diagnosis is extremely important.

The problem of early diagnostics of skin melanoma is still relevant, despite the superficial localization of the tumor, good visibility, no need of expensive examination methods and equipment for diagnostics. In analyzing the distribution of new cases of skin melanoma in stages draws attention to the high proportion of "neglect": the disease was detected at the stage of regional or distant metastases for nearly 1/3 of patients,. This indicates a very low level of diagnosis of primary skin melanoma. High mortality, risk of metastasis and poor prognosis are the consequence of late diagnosis[1].
One of the priority directions in medicine – pervasive and phased implementation in healthcare information systems for the collection, processing, storage and transmission of medical information in the field of cancer of the skin [2]. For the modern physician information system with the application of intelligent technologies is the possibility to reach a qualitatively new level in the diagnosis of cancer, and to make the diagnostic process as short as possible and reliable. The Foundation of intelligent technology are the knowledge base.

The aim of this work is the development of a knowledge base for the information system in the diagnosis of skin melanoma, that integrates the clinical history and diagnostic studies.

| Frequency   | Localization       | Raditory growth         | Vertical growth | Picture |
|-------------|--------------------|-------------------------|----------------|---------|
| Superficial spreading melanoma | 70% | Any, more often — lower limbs and torso | From a couple of months to 2 years. | Postponed |
| Nodular melanoma | 15% | Any, more often — torso, head, neck | A couple of years | More postponed |
| Akrojeniginozny melanoma | 10% | Palm, foot, nail bed | From a couple of months to several years. | Develops early, late recognition |
| Lentigious melanoma | 5% | Face, neck, ovarian | Several years | Highly postponed |
| Amelanotic melanoma | Very rare | Any | | |

**Figure 1.** Clinical forms of skin melanoma.

Visual the diagnosis and to exclude malignant neoplasms pigmentaria are quite difficult in connection with a wide variety of clinical forms of skin melanoma. Clinical forms of skin melanoma are presented in figure 1. The creation and implementation of information knowledge base for the diagnosis of melanoma is particularly important.

2. **Knowledge base for skin melanoma**

Knowledge base was developed for gathering information and testing in skin melanoma. Operation logic consists of comparing information about the patient that is relevant in the context of skin melanoma with the reference data (figure 2). Depending on this comparison, the system should issue a recommendation about the recommended methods of diagnosing, diagnosis, treatment and prognosis for recovery.
Figure 2. The generalized data structure of the skin melanoma diagnosis system.

Patient data means information that was entered by the physician for comparison with information in a reference knowledge base for skin melanoma. It is passport information, anamnesis of life, anamnesis of disease.

Figure 3. A structural model of a knowledge base on skin melanoma.

A structural model of a knowledge base on the skin melanoma is presented in figure 3. Knowledge base should include possible concomitant diseases, symptoms of diseases, methods of diagnosis, types of melanoma and the existing stage, possible treatment methods. A fragment of data structure of the patient represented in figure 4.

Figure 4. A fragment of patient data structure.
Cross-platform developer tools application software Qt was used to develop a knowledge base. Embedded management system relational database SQLite was used for data storage. The program interface is shown in figure 5.

![Figure 5](image.png)

**Figure 5.** The graphical interface of the developed knowledge base.

### 3. Conclusion

An informational knowledge base is developed. It can be applied in clinical practice as a system of decision support for the diagnosis of skin melanoma. The peculiarity of this system is the transition from a local medical information to the integrated system, where all patient data available from a single information environment.

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