WEB-MO - A Computer Aided Learning on WWW

Elena Silvia Bernad^a, Adrian Frantescu^b, Sandor Bernad^c, Corina Vernic^a

^aUniversity of Medicine and Pharmacy, Timisoara, Romania ^bCounty Hospital, Timisoara, Romania ^c University Politehnica, Timisoara, Romania

Abstract

The paper presents an electronic textbook on World Wide Web (WWW), which present theoretical notions about the eyes' movements. It also contains clinical cases as example for the described notions. The application is being tested at the County Hospital, Department of Neurosurgery, Timisoara, Romania. The reaction of the educators and learners is quite positive. We think there will be a great learning tool for the future.

Keywords

Eye movement; Neurosurgery ;WWW

Introduction

The motility of the eye is an issue, which interest more medical domain: ophthalmology, neurology and neurosurgery. A general practitioner also might encounter some patients with these problems.

Strabismus (squint) refers to a muscle imbalance that results in a misalignment of the visual axes of the eyes. It may be caused by weakness of an individual eye muscle (paralytic strabismus) or by an imbalance of muscular tone presumably due to a faulty "central" mechanism that normally maintains a proper angle between the two axes (nonparalytic strabismus). Paralytic strabismus is primarily a neurologic problem; nonparalytic strabismus is more strictly an ophthalmologic problem [1].

Because of the large medical domains of interest, we realized a computer aided learning (CAL) application [2], which help the user for a better understanding of the problems of the eye's movement. We presented the eye's motility problems from neurosurgery point of view. So, the notions, which were described in the program, are adapted for this medical domain.

Materials and Methods

Medical support

Abnormalities of ocular movement are of two basic types:

In one, the disorder of motility can be traced to a lesion of the extraocular muscles themselves or to the cranial nerves that supply them (nuclear or infranuclear palsy);

In the other, the derangement is in the highly specialized neural mechanisms that enable the eyes to move together (supranuclear palsy).

Such a distinction, in keeping with the general concept of upper and lower motor neuron paralysis, hardly conveys an idea of the complexity of the neural mechanisms that govern the ocular motility; nevertheless, it is a useful if not an essential first step in the approach to the patient with defective eye movements. In both cases, it must be recognized, knowledge of the anatomic basis of normal movement is essential to an understanding of abnormal movement.

So, our application helps the user to navigate through the problems of the eye motility and understand both phisiological aspects and pathological aspects of the problems.

Background

We started in the past with presentation of the pathology of the movement of the eye caused just by orbital injury [3]. We develop this application, and present all the pathology of the eye motility caused by various injuries located on different level: infranuclear, nuclear and supranuclear [1,4,5,6,7,8].

To create an easy knowledge assimilation in the eye motility domain, we used the WWW - as an educational medium [9,10,11]. There are many educational applications on the Web [12,13,14], which help the users to enjoy the knowledge assimilation.

The structure of the application

Our electronic textbook called WEB-OM (World Wide Web – Ocular Motility) present theoretical aspects of the eye movement combine with clinical examples.

The notions are structured according to the level of action of the various factors, which produce the pathology of the eye movement (figure 1):

- Nuclear and infranuclear level
- Supranuclear level

Different diseases may give rise to particular defects in ocular movement and these are of diagnostic importance. These diseases have a great variety of causes:

- Infection
- Vascular causes

- Tumors
- Trauma
- Extrinsic ocular muscles affections
- Congenital causes
- Other causes

Therefore in the program exist a permanent link between the localization of the injury and the type of injury (figure 1).



Figure 1 - Link between the localization of the injury and type of injury

In addition of this theoretical presentation, we include a selection from clinical cases. These are introduced such examples from each kind of presented pathology.

These clinical examples were extracted from the County Hospital Timisoara, Department of Neurosurgery database. It describe the following information about the patient:

- Identification of the patient;
- Patient characteristics: general information on patient (date of birth, age; gender; social and marital status; residence; etc.); anamnesis; personal history; family history.
- · current diagnosis; diagnosed by whom.
- History: this part holds the history of the current disease of the patient.
- The pathological finding from the system's review and physical examination.
- The pathological laboratory tests: general analyses of the blood, urine and liquor; biochemistry analysis of the blood; analyses of the blood coagulation; histologic examination.
- The pathological instrumental examination: retinal images; visual acuity; X-ray; computer tomografy; echography; EKG; EEG; etc.
- Other medical specialty consultations, if there were pathological.
- Health care process: medications; therapeutic procedures; operation; complications;
- Result of treatment; state at the time of the discharge.

So, after learn about a theoretical problem, the user can see different real example from the County Hospital, Department of Neurosurgery, Timisoara Romania database (figure 2).

Database



Figure 2 - General structure of the application

Implementation

By its nature, the WWW is a tool ideally and uniquely suited for advancement education. Therefore, our application is a Web page. It's backbone is a HTML (Hypertext Markup Language) file. It was created using by Internet Assistant for Microsoft Word 6.

To become more attractively, we insert in the Web page Java applets. This special type of Java program is run in a virtual machine inside Java-capable Web browsers such as Netscape Navigator 2.0. This virtual machine has been adapted so that applets can't damage the computer to which they are downloaded.

In the application we included more pictures:

- the 2D pictures were marked using by Adobe Photo Shop Release 4;
- for the 3D pictures we used 3Dstudio Release 4;
- the movie pictures were realized as Java applets and with Gif Animator program.

Results

Actual stadium

The program is being tested now at the County Hospital Timisoara, Department of Neurosurgery. The reaction of the educators and learners – students and doctors - towards this kind of education is quite positive. A big number of users have already used the application and this number increased day by day. As it seems, this new form of communication is very interesting both for educators, both for learners, and has great potential for further development in the future.

The data from the program are easy to use also for different statistics processing [15].

Future intents

We intend to realize more links with neurologic and ophthalmologic notions and databases, to obtain a more complete application in the movement of the eye domain.

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Address for correspondence

Elena Silvia Bernad University of Medicine and Pharmacy Department of Medical Informatics P-ta Eftimie Murgu 2 Timisoara Romania, Ro-1900 E-mail: sany@mh.mec.utt.ro