

HIPON Project: Acquiring Medical Experience through an E-learning Platform. A New Perspective in Pathology Education

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Abstract

It is a common idea that achieving excellence, once medical students face professional practice, poses a challenge in education. To achieve this goal in medical education, the prospect of projecting professional experience through an e-learning toolkit is here being proposed as an original teaching strategy.

An educational project on histopathology entitled "ICT eModules on HistoPathology: a useful online tool for students, researchers and professionals - HIPON", co-financed by the Lifelong Learning Program of the Education, Audiovisual and Culture Executive Agency (EACEA), The Commission of the European Union, has been launched at the beginning of 2013.

The project has already resulted in an open resource, multi-language, e-learning platform which aims to offer a valuable teaching instrument to medical students, researchers and professionals. The use of e learning tools, through which students gradually become active professionals and no longer passive recipients of knowledge, has been acknowledged as a considerable improvement in learning. Furthermore, HIPON aims to convey, among the extensive amount of available data, the essential information which can be transformed into medical experience, and thus to promote professional thinking in pathology by means of new teaching strategies which make use of modern technology in the presentation of selected case studies. Taking advantage of modern image technology, the program provides a wide selection of enlargeable microscope high resolution images, supported by educational videos and relevant virtual slides. The latter means attempt to make the text meaningful, helping users understand and consolidate their knowledge. The image-based presentation of several case studies represents the most important and innovative section of the project; step by step, HIPON reproduces the same diagnostic procedure that expert pathologists follow in everyday life, asking the users to implement it themselves through the platform. Based on the principle that clinical scenarios make students more prepared and knowledgeable when they face patients in real life, HIPON case studies supply users with the opportunity to apply their knowledge, deepen their understanding and ameliorate their skills.

By doing all this, HIPON aims to make end-users able to think as experienced pathologists and develop proper competencies. In our opinion, this project aims to represent a new prospective in Pathology education. Taking advantage of this as well as of other continually developing advances in learning modalities, students' learning and performance will hopefully be widely improved.

1. Introduction

Pathology is a major field in modern medicine; it is linked with a number of distinct but inter-related medical specialties which diagnose diseases mostly through the analysis of biological samples. The pathologist's interpretation of a biopsy is critical to establish the final diagnosis and therefore to estimate patients' prognosis and best treatment. In the immense field of modern pathology, an extensive amount of data is available; as many practical skills as possible are requested to be developed by future or present medical professionals. It is a common idea that achieving excellence in students once they enter clinical medicine practice, poses a challenge in education [1]. To achieve this

goal in medical education, the prospect of illustrating professional experience through an e-learning toolkit is here proposed as a new teaching strategy. An educational project on histopathology entitled “ ICT e Modules on HistoPathology: a useful online tool for students, researchers and professionals - HIPON”, co-financed as a Key activity 3 / ICT project of the Lifelong Learning Program of the European Commission Education, Audiovisual and Culture Executive Agency (EACEA) (Reference Number: 531203-LLP-1-2012-1-GR-KA3-KA3MP) has been launched at the beginning of 2013.

2. HIPON platform

HIPON has resulted in a multi-language open-resource, well-structured and user-friendly e-learning platform, which aims to reflect professional experience in pathology, without borders of languages, costs or technical skills. The platform is free for use and is initially available in five languages to thirteen institutions throughout the world. It is likely to be of great interest and utility to a wide range of end-users, since it can be exploited for both public and private educational sectors, either in a distant learning process or a physical teaching process, providing programs specifically tailored to the needs of students (undergraduate, graduate and post-graduate), researchers and professionals.

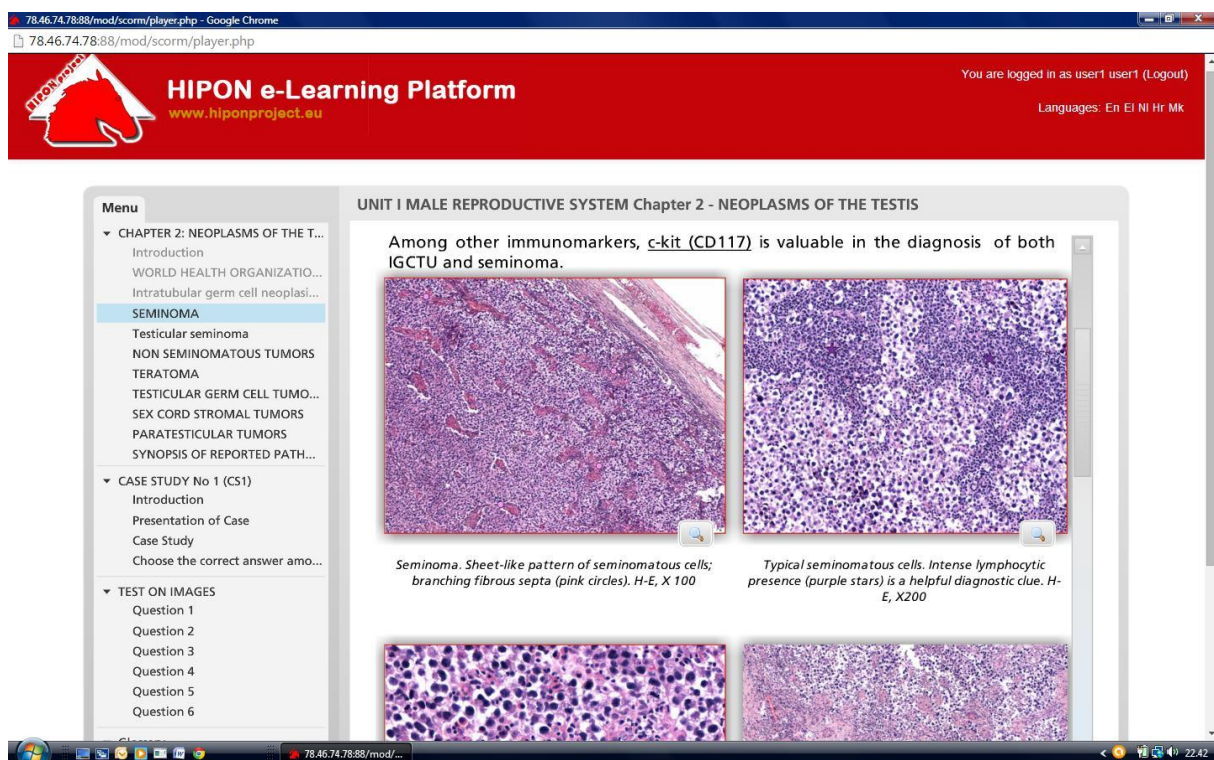


Fig.1. HIPON e-learning platform. In “Neoplasms of the testis” chapter overview, there is an extended microscope image collection with brief appropriate legends, describing tissue architecture patterns of testicular neoplasms, here of seminomas.

3. The project aim: the new perspective of conveying medical experience

The innovative, challenging, new perspective of our project is to teach users how to think as experienced pathologists. The use of e-learning tools through which students gradually become active professionals and no longer passive recipients of knowledge, has been acknowledged as a considerable improvement in learning [2], and has been progressively implemented in medical education [3]. Nowadays, a lot of excellent on line learning tools are available, such as web-based atlases, text books and test books. HIPON project does not aim to provide another of these online tools for studying, but to transform the extensive amount of available knowledge into experience and authorised opinion in pathology through mixed learning pathways, supported by a considerable amount of case data and a rich variety of components of the ICT System, such as multimedia online games, glossary, virtual photo gallery and thematically divided resources. Taking advantage of

modern image technology, the program provides extended microscope high resolution images, supported by educational videos and relevant virtual slides. The learner does not receive just a series of images of tissues but the essence which is the analytical way of thinking behind the images i.e., the process to reach the correct diagnosis. Based on the principle that performing a preclinical procedure makes students more prepared and knowledgeable [1], the use of case studies supplies users with the opportunity to consolidate their knowledge, increase their understanding and improve their skills. Through the educational tools provided by the HIPON e-platform, users familiarize with the analytical diagnostic process and therefore become highly knowledgeable about using all the acquired knowledge on how to approach patients' tissue samples and achieve the correct diagnosis.

3. The platform structure: an example of our educational concept

HIPON platform consists in two sections: General Pathology and Systemic Pathology. The first one deals with basic aspects of pathology, such as inflammation and neoplasia, while the latter presents the various organs/systems of the human body, in its units/chapters. Every chapter begins with an overview section, goes on with the presentation of several case studies, which represent the most important and innovative section of the project, and ends with an image-based test. Glossary terms with their definitions are provided and relevant resources and web links are available for further study. As an example of the application of our educational concept, mention can be made of the "Neoplasms of the Testis" HIPON Systemic Pathology chapter.

3.1 Overview

In the overview section, after the objectives of the chapter are defined, normal tissue architecture is briefly presented and then the pathological patterns with regard to the various tumour types of the testis are analysed. Tissue architecture is always described by means of representative microscope image collections (Fig.1) along with brief, appropriate texts. The image collection is composed of multiple, high resolution, enlargeable images, which are often marked (Fig.2) in order that the most important diagnostic morphological findings are highlighted.

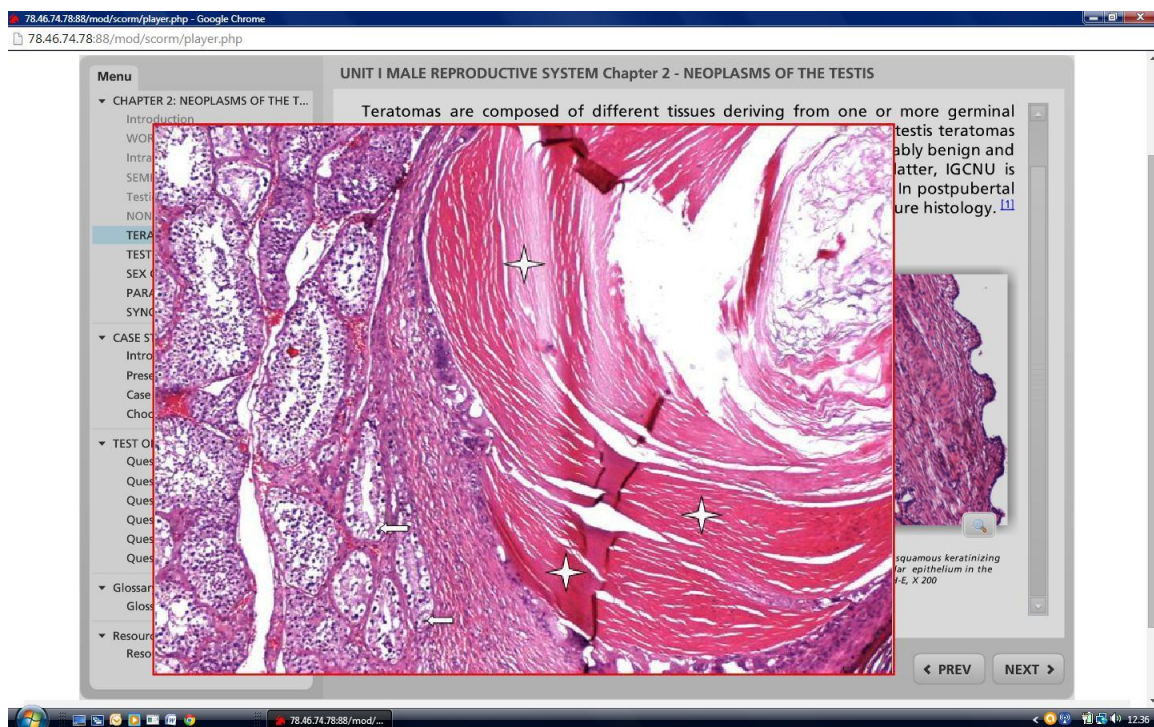


Fig.2. An enlarged, high resolution microscope image of a testicular neoplasm in the relevant HIPON chapter overview. Note the markings (i.e. white stars and arrows) which, together with appropriate comments, stress the most important diagnostic morphologic features.

In this way, patterns of injury are established and useful guidelines on microscopic examination are obtained. Educational videos and relevant virtual slides (a pure seminomatous tumour for this chapter) are provided to help users further consolidate the acquired knowledge.

3.2 Case study presentation

The case study section which follows, reproduces step by step the same diagnostic procedure that an expert pathologist follows in his/her everyday routine; the users are asked to follow it themselves through the platform. The purpose is to transfer “theory” to real life practice [4]. The users learn how to use the knowledge they acquired from the overview so as to approach the particular tissue specimen in the right way and make the correct diagnose. An original case study is presented with images accompanied by targeted questions or comments in order to help users focus their attention on the valuable diagnostic features among all morphologic characteristics of testicular neoplastic cells, and not on confusing details. Simulating real life, users, like professional pathologists, may need additional information so as to define the correct diagnoses; therefore, they can select the data that they believe are of diagnostic value in each specific case study among five fields, i.e. immunohistochemistry, histochemistry, further laboratory data, more detailed patient history and imaging. Some information will not be needed or is already known from the clinical scenario at the beginning of the case study presentation. Users should be able to select the useful information, disregarding that of no diagnostic value. As an example, on clicking “Immunohistochemistry”, a number of necessary (and possibly unnecessary) markers becomes available. For each useful immunohistochemical marker chosen, one or more enlargeable, high resolution images are provided (Fig.3).

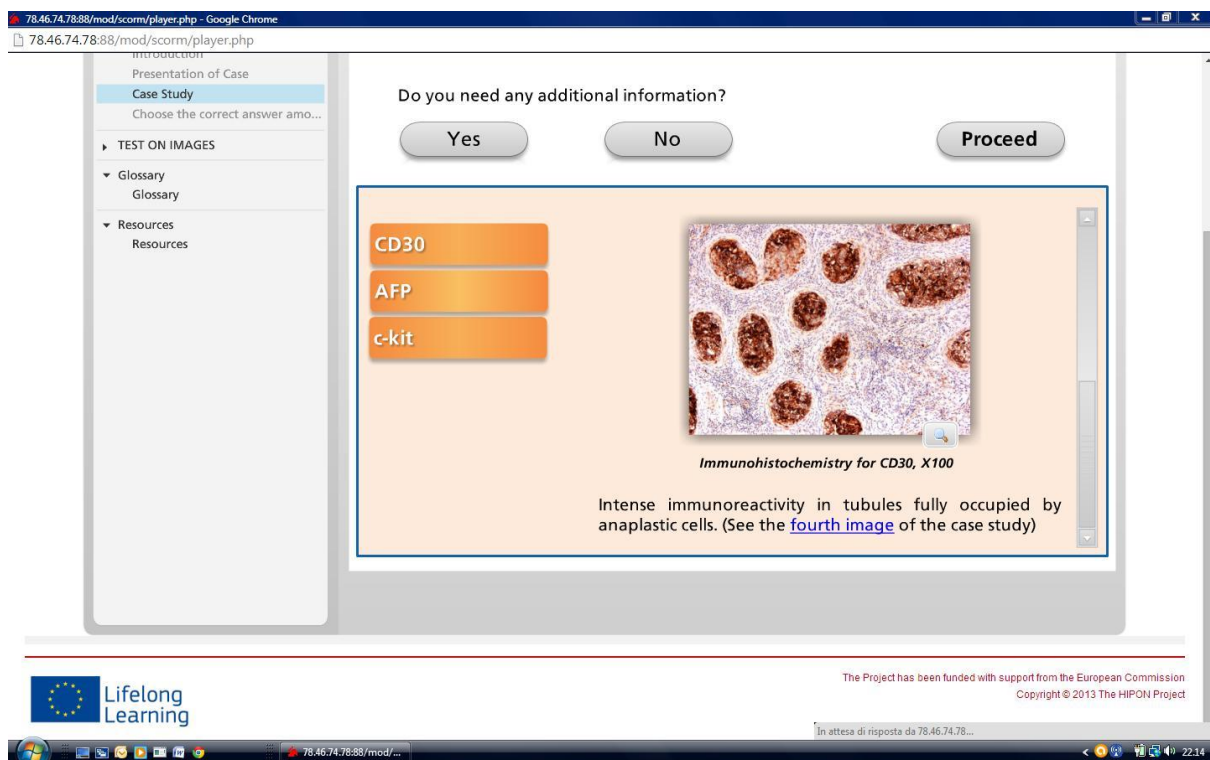


Fig.3. The selection of three immunohistochemical stains in a case study of the HIPON chapter on testicular neoplasia. Note the underlined blue words (i.e. fourth image) which, if clicked, lead users to the relevant haematoxylin-eosin image, already previously presented.

Images are, of course, accompanied by brief informative legends. In this chapter, the same applies to the “Histochemistry” additional information section. The purpose of these “Additional Information” fields is to make users familiar with the process -of vital importance in pathology- of correlating pathological to patients’ other clinic-laboratory data in order to achieve the correct diagnosis. Subsequently, users are asked to choose the right diagnosis among four alternative diagnoses. The correct answer is analytically justified by a detailed explanation which comes next and includes

several apt comments on each of the previously presented images, clarifying the diagnostic significance of each image. After the correct diagnosis is justified, it is clarified why the other diagnostic alternatives cannot be accepted, and basic guidelines for the differential diagnosis are provided. Furthermore, practical tips on the correct pathologic report, underlying the importance of some pathologic information such as the percentage of each tumour component in mixed germ cell testicular tumours, are supplied.

3.3 Image-based test

In the image-based test, the users' acquired diagnostic experience can be evaluated by means of single-answer or multiple-choice, image-based questions (Fig.4). Other enlargeable, high resolution images are provided; the users are asked to identify patterns of lesions and specific diagnostic features on their own. A review of the whole test is provided at the end.

The screenshot displays the HIPON e-Learning Platform interface. At the top, there is a red header with the HIPON logo (a red horse head) and the text "HIPON e-Learning Platform" and "www.hiponproject.eu". On the right side of the header, it says "You are logged in as user1 user1 (Logout)" and "Languages: En El Ni Hr Mk". Below the header, the main content area is titled "UNIT I MALE REPRODUCTIVE SYSTEM Chapter 2 - NEOPLASMS OF THE TESTIS". On the left, there is a "Menu" sidebar with options like "CHAPTER 2: NEOPLASMS OF THE T...", "CASE STUDY No 1 (CS1)", "TEST ON IMAGES", "Glossary", and "Resources". The "TEST ON IMAGES" section is expanded, showing "Question 6" selected. The main content area displays "Question 6: Taking morphology and the shown c-kit immunoreactivity pattern into account, which of the following histological diagnoses is irrelevant?". Below the question is a histological image of testis tissue showing various seminoma components with brown c-kit immunoreactivity. To the right of the image are four radio button options: "Intratubular embryonal carcinoma", "IGCNU", "Intratubular seminoma", and "None is irrelevant; all the above are shown in the image".

Fig.4. A multiple choice image-based question in the "Neoplasms of the testis" HIPON chapter.

4. Conclusion

By doing all this, HIPON aims to make end-users able to think as experienced pathologists and develop proper competencies. Through continual advances in e learning modalities, medical students' learning and performance will hopefully be widely improved. In our opinion, HIPON experiential learning concept is likely to open up new perspectives in science education.

References

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