

*Sudan University of Science and Technology
College of Graduate Studies*

*Evaluation of Using Fourier Infrared
Spectroscopy and Laser – Raman in Bladder
Malignancy Diagnosis*

تقويم استخدام تحويلات فوريير للأطياف في المنطقة

تحت الحمراء و مطيافية ليزر - رمان في تشخيص

سرطان المثانة

*A thesis submitted in fulfillment of the requirements for the philosophy
degree in laser applications in physics*

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Abstract

Bladder cancer is one of the most common cancers in Africa. It takes several days to reach a diagnosis using histological examinations of specimens obtained by endoscope, which increases the medical expense.

Spectroscopic analysis of bladder cancer tissues has received considerable attention due to its sensitivity to biochemical variations in the samples.

The present study investigated the use of FTIR and laser Raman spectrometer as a diagnose tools of bladder cancer.

Fourty two bladder samples were collected from 21 patients during surgery from different hospitals without any pretreatment.

FTIR, with a ceramic source, was used to differentiate between normal and cancerous bladder tissues via the change in the spectra of these samples.

The investigations detected obvious spectroscopic change in the proteins ($1650, 1550 \text{ cm}^{-1}$), lipids ($2925, 2850 \text{ cm}^{-1}$) and nucleic acid ($1080, 1236 \text{ cm}^{-1}$).

With FT Raman spectrometer supplied by Nd:YAG laser, as an excitation source, some of the samples were studied and a significant difference between the normal and cancerous bladder tissues were found around Raman shifts of 1650 cm^{-1} , 1440 cm^{-1} , 1270 cm^{-1} and 1080 cm^{-1} .

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The comparison between the two techniques showed that Raman spectroscopy holds much promising as a rapid, accurate, nondestructive method, and easy to use as an alternative method for identification and diagnosis of bladder cancerous tissues.

المستخلص

سرطان المثانة يعتبر من أكثر أنواع السرطانات شيوعاً في القارة الأفريقية. يأخذ التشخيص العادي للمرض عدة ايام للوصول لفحص النماذج التي يحصل عليها الطبيب بواسطة المنظار ثم يرسلها الى معمل التحليلات المرضية مما يزيد النفقات المالية للتشخيص.

التحليل الطيفي لأنسجة سرطان المثانة بدأ يحظى باهتمام كبير في الاونة الاخيرة بسبب تحسسه للاختلافات الكيماوية الحاصلة في الخلايا الحيوية في العينات مما يساعد في توفير تشخيص سريع ودقيق وأقل كلفة لهذا المرض.

تتحرى الدراسة الحالية امكانية استعمال تحويلات فوربيرر للاشعة تحت الحمراء و تحويلات فوربيرر لرامان، كأدوات تشخيصية لسرطان المثانة.

في هذه الدراسة تم فحص 42 عينة جمعت من 21 مريض أثناء جراحة المثانة من مستشفيات مختلفة قبل اجراء اى معالجة.

تحويل فوربيرر للاشعه تحت الحمراء الذي له مصدر خزفي، أستعمل ليفرق بين أنسجة المثانة الطبيعية والسرطانية حيث تم تحديد فروقات طيفية بين النوعين من الانسجة في: البروتين (1650، 1550 سم⁻¹) ، والدهون (2850 , 2925 سم⁻¹) و الحامض النووي (1080، 1236 سم⁻¹).

كذلك تم استخدام مطياف رامان الذي يستخدم ليزر Nd:YAG كمصدر إثارة لدراسة عدد من هذه العينات حيث سجلت اختلافات طيفية هامة بين أنسجة المثانة الطبيعية والسرطانية وتم تحديد ازاحات رامان حول المناطق 1650 سم⁻¹، 1440 سم⁻¹، 1270 سم⁻¹ و 1080 سم⁻¹.

وبالمقارنة بين الطريقتين، نستخلص أن تحويلات فورير لرامان يمكن اعتمادها كتقانة واعدة جدا في تشخيص سرطان المثانة وذلك لانها تقانة دقيقة و سريعة ، غير إتلافية، وسهلة الاستعمال كبديل للطرق التقليدية في تشخيص التغيرات السرطانية لانسجة المثانة.

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