Original Article

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Use of Computed Tomography to Detect Post-operative Changes After Lichtenstein Inguinal Hernia Repair

Mustafa HASBAHÇECİ[1], Cengiz EROL[2]

[1]Department of General Surgery, Bezmialem Vakif University Faculty of Medicine, Istanbul, Turkey
[2]Department of Radiology, Istanbul Medipol University, Istanbul, Turkey

ABSTRACT

Objective: This study aimed to evaluate the effect of computed tomography to visualize the post-operative changes after Lichtenstein inguinal hernia repair.

Methods: Patients with Lichtenstein inguinal hernia repair and post-operative computed tomography scans were included. There were 11 male patients with 14 hernias; the mean age was 63.9±9.2 years. Time interval between inguinal hernia repair and imaging was 186±70 days (median, 211 days). After multiplanar reformatting, images were reviewed with respect to the post-operative changes and visualization of anatomic structures that were found in the inguinal region.

Results: The inferior epigastric artery and vein, inguinal ligament, spermatic cord, and pubic tubercle were clearly detected in all patients. Small fluid collections were observed only during early post-operative period in two patients (14.3%). Minimal thickening of the inguinal ligament with fatty streaks and completely normal appearance were present in eight (57%) and six (43%) inguinal regions, respectively.

Conclusion: Multiplanar reformatting helps physicians in visualizing the inguinal anatomy in the patients with hernia after surgery. Lichtenstein inguinal hernia repair may be regarded as the gold standard technique for inguinal hernia repair because of the lack of any destructive anatomical changes.

Keywords: Inguinal hernia, computed tomography, Lichtenstein hernia repair

Introduction

Inguinal hernia repair as a frequent condition is one of the most commonly performed operations in the practice of general surgery worldwide (1, 2). Among the several different types of operations, Lichtenstein inguinal hernia repair has been performed for the repair of inguinal hernia with great success since 1984 (3).

It has been known that the use of imaging techniques in diagnosis or the differentiation of inguinal hernia is limited (4, 5). Although there have been several reports with regard to the radiological changes during the development of inguinal hernia or imaging findings after totally endoscopic pre-peritoneal inguinal hernia repair, the visualization of the anatomic structures after Lichtenstein hernia repair and the imaging findings of the inguinal region have not yet been studied in detail (6). In this study, we aimed to describe the spectrum of post-operative computed tomography (CT) findings in patients who have undergone Lichtenstein inguinal hernia repair.

Methods

The study was approved by the institutional review board. An approval by an ethics committee and informed patient consent were not required because of its retrospective design and because it did not include patients' data, respectively.

Patients

Between September 2005 and February 2012, the subjects included 11 male patients with 14 hernias (mean age, 63.9±9.2 years) with CT images after Lichtenstein inguinal hernia repair detected using cross-reference with Hospital and Radiology Information Systems. Presence of the operation and post-operative CT scan in the same patient was regarded as the inclusion criteria. The CT images were taken either for unrelated reasons except inguinal hernia

Address for Correspondence: Mustafa Hasbahçeci; Department of General Surgery, Bezmialem Vakif University Faculty of Medicine, Istanbul, Turkey.
Phone: +90 212 453 17 00 E-mail: hasbahceci@yahoo.com

or at the discretion of the surgeon. The mean time interval between inguinal hernia repair and CT was 186±70 days (median 211 days). All the stored images of the identified patients in the picture archiving and communication system (PACS; GE Healthcare, Milwaukee, Wisconsin, USA) were reviewed by one radiologist.

Evaluation and imaging techniques

All abdominal CT examinations were performed with a 64-detector CT scanner (Lightspeed VCT; GE Healthcare, Milwaukee, Wisconsin, USA). CT examinations were performed with oral and intravenous contrast medium. All images were reconstructed as 2.5-mm axial sections and sent to the PACS. Stored image data sets in the PACS were analyzed again for the study group.

Axial images were reformatted to sagittal, coronal, and oblique planes; scans of each patient were reviewed with regard to the inguinal ligament, inferior epigastric artery, inferior epigastric vein, pubic tubercle, and spermatic cord. The collected data were compiled in an electronic database (Microsoft Excel for Windows, Microsoft Corporation, Redmond, WA). Continuous variables were expressed as the mean±standard deviation and as the median value, if necessary. Categorical variables were expressed as frequencies with percentages.

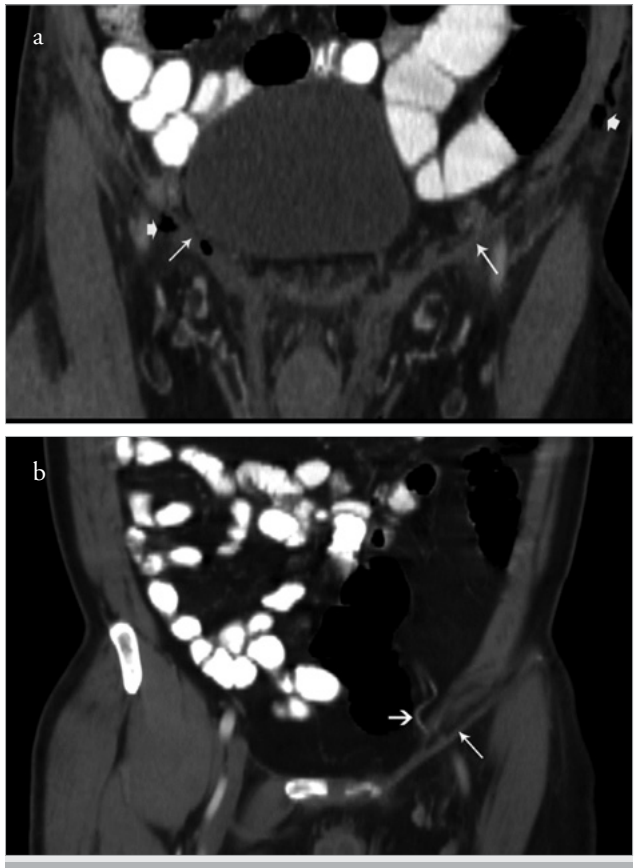

Figure 1. a, b. Coronal reformatted (a) image shows bilateral intact inguinal ligament (arrows at both sides) with peri-ligamentous edema and air (arrowheads at both sides) observed 2 days after bilateral inguinal hernia repair, coronal reformatted (b) CT image of another patient who was operated for inguinal hernia 2 years ago shows normal appearing left inguinal ligament (thin arrow) coursing between pubic tubercle and iliac spine, and the inferior epigastric vessels (thick arrow)

Results

In the study group, anatomic landmarks including the inferior epigastric artery, vein, inguinal ligament, spermatic cord, and pubic tubercle were clearly detected in all patients. Small fluid collections were observed only in two hernias (14.3%) in whom CT scans were taken during the early post-operative period (post-operative days 2 and 5; Figure 1a). Minimal thickening of the inguinal ligament with post-operative changes including fatty streaks around it (Figure 1b) and completely normal appearance were present in eight (57%) and six (43%) inguinal regions, respectively. Recurrence was detected only in one patient.

Discussion

Although the classification of inguinal hernia is usually based on the findings obtained during pre-operative physical examination and surgical repair, new technology with multiplanar reformatting helps to produce high-resolution sagittal, coronal, and oblique images in any plane from raw axial images by facilitating the visualization of relevant anatomic structures (4, 7-9). It has been reported that the inferior epigastric artery is detectable in more than 90% of all inguinal hernia patients, particularly on unenhanced computed tomography examinations using multiplanar reformatting (1, 8). In this study, it was also possible to visualize the inferior epigastric artery as well as the vein, inguinal ligament, spermatic cord, and the pubic tubercle in all the cases. It is believed that it could be accomplished with the use of multiplanar reformatting technique. However, radiation exposure and higher cost are important issues for the patient with an inguinal hernia. Therefore, CT scans were performed only for unrelated causes, except inguinal hernia.

In the literature, there is a limited number of studies dealing with post-operative changes after Lichtenstein tension-free inguinal hernia repair. Appearance of polypropylene mesh as a line with similar CT attenuation to adjacent muscle or low-density band-like structures adjacent to slightly hyperdense reactive tissue has been reported (2, 5, 6, 10, 11). In a study by Crespi, it has been reported that on performing ultrasonography, the mesh appeared as a linear hyperechoic image measuring approximately 2 mm in thickness, with posterior acoustic shadow and a finely irregular surface. However, it was possible to visualize the prosthetic mesh in 2 out of 8 patients with CT (6). In accordance with these findings, it was impossible to

observe the polypropylene mesh in the inguinal area during the late post-operative period in contrast to the early post-operative changes. In 8 of 14 hernias in the present study, we could only detect the minimal thickening of the inguinal ligament and fatty streaks around the ligament as an indirect sign of mesh implantation. To overcome the problem of visibility of meshes, iron-loaded meshes were used during magnetic resonance imaging (5). It is believed that these types of approaches are used only with scientific purposes without benefit to the patients.

Small fluid collections in front of the meshes were detected in patients in whom CT was performed at the early post-operative period (days 2 and 5). Incidence of fluid collections after inguinal hernia repair was reported to be between 0% and 17% (2, 8, 9). This type of fluid collection, either seroma or hematoma, should not be interpreted as the recurrence of hernia because of their similar appearances. Differentiation of post-operative inguinal hematoma or seroma from the recurrence can be performed by serial physical examinations and by the use of ultrasonography or CT.

A thickened spermatic cord is another relatively common finding in the immediate post-operative period and restoration to the normal size is usually observed during the follow-up (10). It was also shown that visualization of the important anatomic landmarks with their normal appearances after Lichtenstein inguinal hernia repair could be possible in all cases. In the light of these findings, it has been concluded that this type of hernia repair does not cause any destructive anatomical changes in the inguinal region. Therefore, Lichtenstein inguinal hernia repair may be accepted as the gold standard technique from the anatomical point of view. However, studies focusing on post-operative changes after totally extra-peritoneal and trans-abdominal hernia repairs are also lacking to compare the effect of different surgical techniques.

Hernia repair frequently includes the implantation of a prosthetic mesh that may cause some specific complications, including the formation of meshoma and/or pelvic pseudo lesions as well as the migration of the meshes to other abdominal organs (2, 6, 10-13). In one study, it has been reported that there were nine complications with regard to the repair or the mesh detected by ultrasound in 14 patients (6). Although the time period for this evaluation was unknown, it is expected to encounter fewer complications after Lichtenstein hernia repair.

Besides the presence of one small recurrence in an asymptomatic patient, severe complications related with meshes including meshoma and pelvic pseudo lesion were absent in our patients.

Study limitations

There were some limitations belonging to our study. Retrospective design and small number of cases were the major limitations.

Conclusion

Although radiation exposure and higher cost should be regarded as the factors that should be avoided while taking CT in all cases, multiplanar reformatting helps physicians to understand the inguinal anatomy in patients with inguinal hernia during post-operative periods in the selected patients. Because of the lack of any destructive anatomical changes after Lichtenstein inguinal hernia repair, it may be regarded as the gold standard technique for inguinal hernia repair from the anatomical point of view. However, future prospective studies comparing different types of hernia repairs are needed.

Ethics Committee Approval: Due to the retrospective nature of this study, ethics committee approval was waived.

Informed Consent: Due to the retrospective nature of this study, informed consent was waived.

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