

C. Gutiérrez de la Peña
J. Vargas Romero
J. A. Diéguez García

The value of CT diagnosis of hernia recurrence after prosthetic repair of ventral incisional hernias

Received: 26 June 2000
Revised: 29 September 2000
Accepted: 2 October 2000
Published online: 23 February 2001
© Springer-Verlag 2001

C. Gutiérrez de la Peña (✉)
C/ Paraíso, Edificio Rosaleda-2, 90A,
11405 Jerez de la Frontera, Spain
E-mail: carlosgutierrez@ctv.es
Phone: +34-95-6307153
Fax: 34-95-6358041

C. Gutiérrez de la Peña
Department of Surgery,
Jerez General Hospital,
C/ Carretera Circunvalación s/n.,
11407 Jerez de la Frontera, Spain

J. Vargas Romero · J. A. Diéguez García
Department of Radiology,
Jerez General Hospital,
C/ Carretera Circunvalación s/n.,
11407 Jerez de la Frontera, Spain

Abstract Herein we present a prospective study made to compare the diagnostic value of a physical examination and a CT scan in the detection of a hernia relapse after carrying out of a intraperitoneal hernioplasty using a non-resorbable mesh. Fifty patients operated on for intraperitoneal hernioplasty with ePTFE mesh and postoperative symptomatology were assessed within a year of the operation via a physical exploration and CT. Each of the patients was subjected to an exploratory laparoscopy for the purpose of confirming the diagnosis. The data were analysed statistically using a chi-square test, sensitivity, specificity, confidence limits, positive predictive value, and negative predictive value. The hernia relapse was correctly diagnosed in 98 % of cases by CT and in 88 % of cases in the phys-

ical examination. The sensitivity was 1 in the CT examination and 0.75 in the physical examination, and the specificity results were 0.97 and 0.90, respectively. The positive predictive value in the CT exam was 0.88, whereas in the physical examination it was 0.60. The negative predictive values were 1 and 0.95, respectively. The differences between the values of both methods held a statistical meaning (chi-square test; $p < 0.05$). The postoperative assessment by CT of symptomatic patients who have been operated on for an intraperitoneal hernioplasty with unabsorbable mesh facilitates carrying out a correct diagnosis in the detection or exclusion of hernial relapse.

Key words CT · Incisional hernia · Abdominal wall hernia

Introduction

Although tension-free repair with non-resorbable mesh of the postlaparotomic hernia has considerably reduced the incidence of relapses [1], between 1 and 10 % of patients have suffered from a new incisional hernia [2, 3].

The majority of postlaparotomic hernias are easily diagnosed by inspection and palpation. However, after a hernioplasty, the existence of the non-resorbable mesh and the fibrosis that accompanies it may complicate its clinical diagnosis or render it impossible. Obesity, abdominal distension or a spontaneous contraction of the abdominal wall are factors which may make its detection difficult during physical examination. In these cir-

cumstances, evaluation of the abdominal wall by a CT may provide a correct diagnosis of the hernia relapse [4, 5].

We present a prospective study, the aim of which was to compare the diagnostic value of physical examination and CT in detection of hernia relapse after carrying out a intraperitoneal hernioplasty using non-resorbable mesh.

Materials and methods

Fifty patients operated on for incisional hernia were assessed within a year of the operation due to the presence of pains in the

Table 1 Physical examination and CT findings with regard to findings at laparoscopic examination

	True positive cases	True negative cases	False positive cases	False negative cases
CT	8	41	1	0
Physical examination	6	38	4	2



Fig. 1 False positive of physical exploration. Intense fibrosis around the mesh



Fig. 2 False positive of physical exploration. Haematoma of frontal rectum

abdominal wall or detection of a tumour in the laparotomy scarring. Thirty-two of the patients were women and 18 were men, with an average age of 58 years (age range 38–77 years). The operating technique in each case consisted of the intraperitoneal placement of an ePTFE mesh (MycroMesh Biomaterial, 10 × 15 or 15 × 19 cm, 1 mm thick; Gore and Associates, Flagstaff, Ariz.), sutured 5 cm from the hernial ring.

The assessment consisted of an exhaustive abdominal palpation and, with prior consent of the patient, a CT scan. The CT was always carried out by the same radiologists, without prior information on the location of the inserted mesh, nor of the findings obtained from the physical exploration.

The CT scans were performed with a CT scanner, CT Sytec 3000 (GE Medical Systems, Milwaukee, Wis.). Firstly, conventional CT scans through the total abdomen were done with 10-mm slice thickness at 10-mm intervals. Additional thin-section CT scans, usually 10–15 scans, were performed through the mesh with 5-mm collimation at 5-mm intervals, employing a standard algorithm. All patients were given an oral contrast, and none of the patients received an intravenous contrast.

At some stage or other during the examination, all the patients were told that they would undergo a Valsalva manoeuvre, to facilitate the detection of a possible hernia relapse.

After the physical exploration and CT, a laparoscopic exploration was proposed to each of the patients. It was accepted in all of the cases. The laparoscopic exploration, by displaying the intraperitoneal mesh and the hernial relapse without any possible diagnostic error, enables the corroboration of the data obtained using both methods and correction of the hernial defect at the same time. In those cases where the hernia relapse was confirmed in this laparoscopic examination a new intraperitoneal mesh was placed.

The statistical method used was the chi-square test, 95% confidence limits, sensitivity and specificity, positive predictive value and negative predictive value.

Results

The physical exploration detected in 10 patients a tumour in the vicinity of the mesh, which was considered as a hernia relapse. On six occasions the diagnostic was correct, and in 4 there was a false positive. In 9 cases the CT reported it as a hernia relapse, one of the cases being a false positive. The findings of the physical examination of the patient and of the CT scan with regard to the findings of the laparoscopic examination are shown in Table 1.

The hernia relapse was correctly diagnosed using CT in 98% of cases (95% confidence limits: 87–104%) and in the physical examination in 88% of the patients (95% confidence limits: 74–101%). The sensitivity was 1 in the examination by CT and 0.75 in the physical examination, and the specificity was 0.97 and 0.90, respectively. The positive predictive value in the CT exam was 0.88, whereas in the physical examination it was 0.60. The negative predictive values were 1 and 0.95, respectively. Significant statistical differences existed in the results obtained using each of these methods (chi-square test, $p = 0.006$).

Discussion

The use of prosthetic materials for the repair of incisional hernias led to an important decrease in the incidence of relapses [6, 7, 8, 9]; however, approximately



Fig. 3 True positive of CT. Hernial relapse around the mesh



Fig. 4 False positive of CT. Small mass of soft tissue which, due to its location and continuity with small intestine, suggested hernial relapse

10% suffered a new relapse in the first 12 months after the hernioplasty [10].

The diagnosis of this new hernia relapse is usually easy using abdominal inspection and palpation, although between 5 and 10% are not detected at physical examination [11, 12].

The existence of the mesh and the intense fibrosis that it gives rise to on occasions (Fig. 1) may complicate its diagnosis. Even when the injury is palpable in the abdominal wall, the diagnosis may not always be clear [4]. The hernia tumour can be confused with a haematoma (Fig. 2), lipoma or with a liquid build-up located on the mesh [13].

Although CT is a widely used technique in the assessment of incisional hernia [14, 15, 16], because it enables viewing of the herniated intestinal loop, the defect in the abdominal wall and the width of the hernial ring (Fig. 3), its diagnostic value in detection of a hernial relapse after repair of an incisional hernia with prosthetic material is insufficiently defined. The existence of the intraperitoneal mesh, the possible adherence of an intestinal loop to the mesh and the relatively frequent formation of a subcutaneous collection of liquid due to the porosity of the mesh could lead to an error occurring in the radiological interpretation [17].

Our series of exhibited results reflect the difficulty, even in experienced hands, of carrying out a correct diagnosis with the physical exploration. Even though a sensitivity of 0.75 and a specificity of 0.90 may be considered acceptable in the clinical assessment, it is no less certain that there were a significant number of cases where the diagnosis was erroneous. We obtained better results with CT. We did not have any false negatives and only one false positive. This occurred with a patient whose radiological images showed a small soft tissue tumour, joined to the mesh in the preperitoneal area, which was mistaken for an intestinal loop (Fig. 4).

Comparing both methods, CT shows a greater diagnostic reliability in the detection of hernial relapses after repair of incisional hernias with prosthetic material. A negative predictive value of 1, and a positive predictive value of 0.88, convert it into an instrument of great use in the diagnosis of hernial relapses.

In conclusion, although the diagnosis of the hernial relapse is essentially a clinical one, where prior repair has been done with prosthetic material, we believe that carrying out a CT exam as part of the postoperative assessment of symptomatic patients should be a regular practice.

References

1. Utrera González A, De la Portilla de Juan F, Carranza Albarrán G (1999) Large incisional hernia repair using intraperitoneal placement of expanded polytetrafluoroethylene. *Am J Surg* 177: 291–293
2. Leber GE, Garb JL, Alexander AI, Reed WP (1998) Long-term complications associated with prosthetic repair of incisional hernias. *Arch Surg* 133: 378–382
3. Oussoultzoglou E, Baulieux J, De la Roche E, Peyregne V, Adham M, Berthou N, Ducerf C (1999) Long-term results of 186 patients with large incisional abdominal wall hernia treated by intraperitoneal mesh. *Ann Chir* 53: 33–40

4. Rose M, Eliakim R, Bar-Ziv Y, Vromen A, Rachmilewitz D (1994) Abdominal wall hernias. The value of computed tomography diagnosis in the obese patient. *J Clin Gastroenterol* 19: 94–96
5. Hojer AM, Rygaard H, Jess P (1997) CT in the diagnosis of abdominal wall hernias: a preliminary study. *Eur Radiol* 7: 1416–1418
6. Anthony T, Bergen PC, Kim LT, Henderson M, Fahey T, Rege RV, Turnage RH (2000) Factors affecting recurrence following incisional herniorrhaphy. *World J Surg* 24: 95–101
7. Arnaud JP, Tuech JJ, Pessaux P, Hadchity Y (1999) Surgical treatment of postoperative incisional hernias by intraperitoneal insertion of Dacron mesh an aponeurotic graft: a report on 250 cases. *Arch Surg* 134: 1260–1262
8. Balén EM, Díez-Caballero A, Hernández-Lizoáin JL, Pardo F, Torramadé JR, Regueira FM, Cienfuegos JA (1998) Repair of ventral hernias with expanded polytetrafluoroethylene patch. *Br J Surg* 85: 1415–1418
9. Bonnamy C, Samama G, Brefort JL, Le Roux Y, Langlois G (1999) Long-term results of the treatment of eventrations by intraperitoneal non-absorbable prosthesis (149 patients). *Ann Chir* 53: 571–576
10. Lee GH, Cohen AJ (1993) CT imaging of abdominal hernias. *AJR* 161: 1209–1213
11. Ghahremani GG, Jimenez MA, Rosenfeld M, Rochester D (1987) CT diagnosis of occult incisional hernias. *AJR* 148: 139–142
12. Miller PA, Mezwa DG, Feczko PJ, Jafri ZH, Madrazo BL (1995) Imaging of abdominal hernias. *Radiographics* 15: 333–347
13. Goodman P, Balachandran S (1992) CT evaluation of the abdominal wall. *Crit Rev Diagn Imaging* 33: 461–493
14. Micheau P, Puech JL, Rouge D, Chavoïn JP, Joffre F, Costagliola M (1989) *Presse Med* 18: 1337–1339
15. Grolleau JL, Otal P, Micheau P, Chavoïn JP, Costagliola M (1997) Imaging of abdominal wall eventration: role and value of X-ray computed tomography. *Ann Chir* 51: 327–332
16. Zarvan NP, Lee FT, Yandow DR, Unger JS (1995) Abdominal hernias: CT findings. *AJR* 164: 1391–1395
17. Lin BH, Vargish T, Dachman AH (1999) CT findings after laparoscopic repair of ventral hernia. *AJR* 172: 389–392