

図2 NSASCC 01 無作為化比較試験の生存曲線

どの分子標的薬も補助化学療法に用いられるようになり、その効果が期待されている。しかし、決して安い薬剤ではないだけに医療費への圧迫も心配される。Saltzが2005年のASCOで発表した患者1人当たりのFOLFOXの推定費用\$40,506に、現在の為替(¥115/\$)を掛け、厚生労働省がん研究助成金報告書による1998年の推定大腸癌罹患数(89,571人)を掛け、1991~1994年の大腸癌全国登録からのstage III症例の割合を掛けると、合計¥118,790,212,745となる。これは医療費削減を求められている日本では大きな費用である。今後、薬剤費用の見直し、再発高リスク患者のより正確な選択、再発高リスク患者への選択的な治療、再発リスクによる患者のグループ分け、再発リスクに応じた費用対効果の高い治療法の選択、など何らかの方策を考えなければならない時点に来ている。

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## 外肛門括約筋に浸潤あるいは近接する直腸癌の術前 MRI 診断

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外肛門括約筋に浸潤あるいは近接する肛門管近傍の下部直腸癌症例を正確に診断することは Intersphincteric resection の適応決定に重要である。今回われわれは直腸切断術症例の病理組織所見と術前 MRI 所見を対比し、外肛門括約筋に浸潤あるいは近接する直腸癌の診断に MRI が有用であるか検討した。方法：直腸切断術を施行した 26 例を対象とした。病理組織学的に腫瘍先進部から外肛門括約筋内側縁までの距離を測定し、1mm 以下の場合を外肛門括約筋近傍浸潤と定義した。MRI T2 強調画像において外肛門括約筋浸潤に関する診断基準を定め、組織学的所見との対比を行った。結果：組織学的に外肛門括約筋近傍浸潤例は 7 例、括約筋内浸潤例は 2 例であった。MRI による括約筋内浸潤あるいは近傍浸潤診断は感度 89%、特異度 82% であった。結語：MRI は外肛門括約筋に浸潤あるいは近接する直腸癌の診断に有用である。

索引用語：直腸癌, Intersphincteric resection, 外肛門括約筋浸潤, MRI

## 背 景

Circular stapler などの Device や手技の発達により低位直腸癌症例において自然肛門を温存する機会が多くなった。しかし肛門管近傍の直腸癌に対しては永久的人工肛門をとまう直腸切断術（以下、APR）が行われることが多い。近年 Intersphincteric resection（以下、ISR）を行うことによって肛門管近傍の直腸癌に対しても自然肛門を温存することが可能となってきた<sup>1-3)</sup>。肛門機能を可能な限り温存しつつ局所再発を抑えるためには、外肛門括約筋内へ浸潤する症例、または外肛門括約筋に近接するため括約筋間を剥離すると margin が確保できない症例は ISR の適応外となる可能性が高い。しかし外肛門括約筋への浸潤の有無を術前に評価し ISR の適応の参考とする診断法として何が優れているかはまだ明らかではない。一方、直腸癌の術前深達度診断に magnetic resonance imaging（以下 MRI）が有用であることが報告されており<sup>4-7)</sup>、ISR の適応決定に関する診断方法としても期待される。今回われわれは APR 症例の病理所見と術前 MRI 所見を対比し、外肛門括約筋浸潤症例あるいは非浸潤症例の術前診断

に MRI が有用であるか否かを検討したので報告する。

## 対 象

術前大腸内視鏡における生検で腺癌と診断された直腸癌症例のうち、2002 年 9 月から 2005 年 8 月までに APR が行われた症例 26 例を対象とした。その内訳は男性 15 例女性 11 例、年齢は 44 歳から 84 歳（平均 64.5 歳）であった。術前放射線治療が行われた症例は除外した。

## 病理組織学的検討

摘出標本は腫瘍反対側で切除後すぐに切開し、48 時間 10% ホルマリンにて固定を行った。病変部の連続切片を作製し、ヘマトキシリン・エオジン染色（HE 染色）を行った後に病理組織学的検討を行った。検討項目は歯状線から腫瘍下縁の距離、最大腫瘍径、組織型、深達度、外肛門括約筋内への癌浸潤の有無、肛門管レベルにおける腫瘍先進部と外肛門括約筋内側との距離である。距離の測定は外肛門括約筋と腫瘍を含むプレパラートで行い、その内で最短距離を採用した。外肛門括約筋内に浸潤を認めな

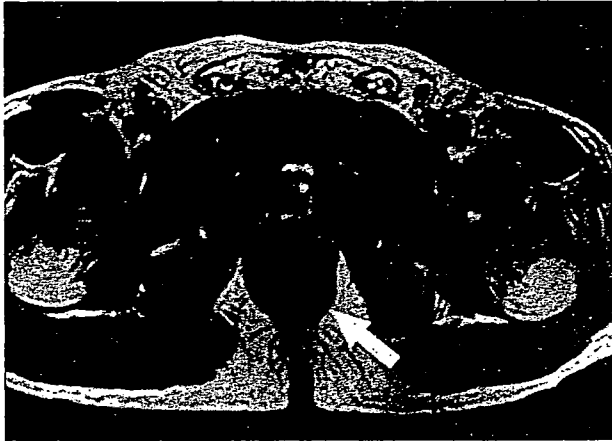


Fig. 1 Axial T2-weighted image demonstrated the increased signal intensity at the external anal sphincter muscle that was adjacent to the tumor. (arrow)



Fig. 2 Sagittal T2-weighted image demonstrated the irregularity of the border between the advancing edge of the tumor and the external anal sphincter muscle. (arrow)

Table 1 Patients' Profile (n=26)

Age (yr)	64.5 (44-84)
Gender (male : female)	15 : 11
Histological classification	
well	7
moderately	15
mucinous	3
other	1
Depth of tumor invasion	
sm	1
mp *	7
a1 *	6
a2 *	10
ai *	2
Mean tumor size (cm)	4.9 (2.0-7.5)
Pathology	
ESI positive	2
paraESI positive	7
ESI and paraESI negative	17

ESI : External anal sphincter invasion

paraESI : para External anal sphincter invasion

well : well differentiated adenocarcinoma

moderately : moderately differentiated adenocarcinoma

mucinous : mucinous carcinoma

\* : Depth of tumor invasion at lower rectum

いが肛門管レベルでの腫瘍先進部と外肛門括約筋内側縁との距離が 1mm 以下の場合に外肛門括約筋近傍浸潤と定義した。

#### MRI の検討

今回の検討には GE 社製 GENESIS SIGNA, 1.5T および phased array coil を使用して, T2 強調画像 (撮像条件 : TR/TE = 3,000/102msec, Echo Train

Length = 13, FOV = 250mm, matrix = 224 × 320, スライス厚 = 5mm, ギャップ = 1mm, 加算回数 4 回) を矢状断, 冠状断, 軸位断で撮影した。腸管洗浄を目的とした前処置や抗コリン剤は使用しなかった。MRI の診断は同一の放射線科医が病理結果や他の画像所見に関する情報なしで対象症例の術前 MRI 画像を読影した。MRI において以下の①②のいずれかの所見を認めた場合に外肛門括約筋浸潤陽性と定めた。①T2 強調画像において腫瘍に接する外肛門括約筋内の信号に変化がある (Fig. 1), ②腫瘍と外肛門括約筋との境界が不整である (Fig. 2)。切除標本における外肛門括約筋内浸潤あるいは近傍浸潤の有無と MRI における浸潤診断とを比較検討し, 浸潤あるいは近傍浸潤に関する術前 MRI の感度・特異度・正診率を求めた。また MRI 診断における陽性例と陰性例の間で肛門管レベルでの腫瘍先進部と外肛門括約筋内側縁との距離に違いが存在するかを比較検討した。

統計学的検討は Mann-Whitney U test を用いて行い,  $p < 0.05$  の場合に有意差ありと判断した。

#### 結 果

歯状線から腫瘍下縁の距離は平均 0.3cm で, 全例 2cm 以下であった。対象症例の背景因子を Table 1 に示す。外肛門括約筋内に癌の浸潤を認めた症例は 2 例であり, 浸潤を認めなかったが肛門管レベルで癌先進部と外肛門括約筋内側縁との距離が 1mm 以下の近傍浸潤を認めた症例は 7 例であった (Fig. 3, 4)。外肛門括約筋内浸潤, 近傍浸潤ともに陰性の症



Fig. 3 Histological findings showed moderately differentiated adenocarcinoma infiltrating the striated muscle.

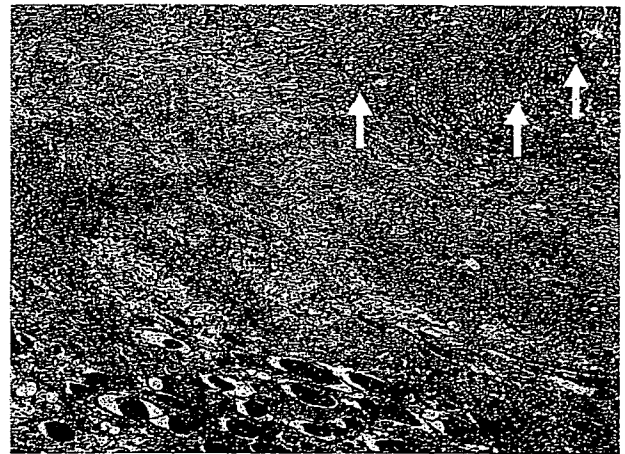


Fig. 4 Histological findings showed the fibrosis between tumor (arrow) and the striated muscle. The distance between the tumor and the inter rim of the external anal sphincter muscle was 0.8mm.

Table 2 Comparison of MRI and pathology reporting of external anal sphincter involvement

External anal sphincter invasion on MRI	Pathology (ESI + paraESI)	
	positive	negative
positive	8	3
negative	1	14

MRI = magnetic resonance imaging  
ESI : External anal sphincter invasion  
paraESI : para External anal sphincter

例は 17 例であった。

術前 MRI 診断と病理学的所見との比較を Table 2 に示す。MRI にて外肛門括約筋浸潤陽性と診断した症例は 11 例であり、このうち 2 症例は組織学的に外肛門括約筋内浸潤を認めた。実際に外肛門括約筋内浸潤を認めたのはこの 2 症例のみであった。また MRI にて浸潤陽性と診断された残り 9 症例のうち 6 例には組織学的に近傍浸潤を認めた。逆に組織学的に外肛門括約筋内浸潤あるいは近傍浸潤を認めた症例は 9 例あり、このうち 8 例は術前 MRI において浸潤陽性として診断されていた。術前 MRI は外肛門括約筋内浸潤あるいは近傍浸潤のある症例を感度 89%、特異度 82%、正診率 85% で診断可能であった。病理標本上、筋内浸潤、近傍浸潤ともに陰性であるが MRI にて浸潤陽性とされた 3 症例では腫瘍と外肛門括約筋との間に線維化と炎症細胞浸潤を認めた。また病理標本上、近傍浸潤陽性であったが MRI で陰性と診断された症例では腫瘍と外肛門括

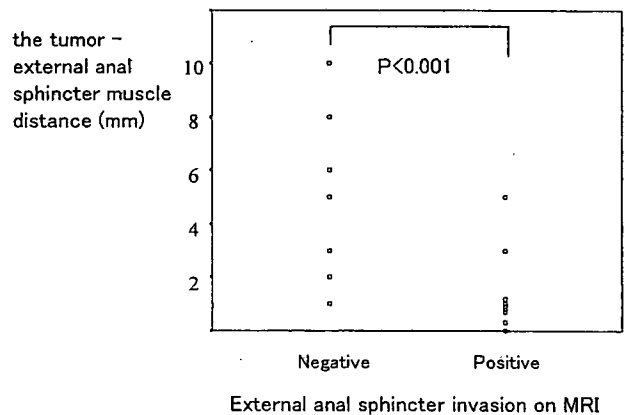


Fig. 5 Correlation between the tumor-external anal sphincter muscle distance and the external anal sphincter muscle invasion on MRI.

約筋との間にほとんど反応性の組織学的変化を認めなかった。

肛門管レベルでの腫瘍先進部と外肛門括約筋内側縁間の距離と MRI 診断との関係を Fig. 5 に示す。MRI にて浸潤陽性とされた症例では腫瘍先進部と外肛門括約筋内側縁間の距離の中央値は 0.9mm、陰性症例では 5.0mm であった。術前 MRI にて浸潤陽性と診断された症例は陰性症例と比較して、統計学的有意差 ( $p < 0.001$ ) をもって腫瘍と外肛門括約筋との距離が近いことが判明した。

### 考 察

ISR は肛門管近傍に浸潤する直腸癌においても肛

門温存を可能とする術式であるため本邦でも行われつつある<sup>89)</sup>。ISR では外肛門括約筋を温存しつつ内肛門括約筋を切除するため、今まで肛門側断端における距離の不足から直腸切断術が行われていた症例でも肛門温存が可能となった。しかし肛門機能は外肛門括約筋のみで保持されることになるために外肛門括約筋を出来る限り温存する必要がある。そのため適応は外肛門括約筋に浸潤が無い症例に限られるが、外肛門括約筋浸潤に関する診断方法は確立されていない。今回の検討で、術前 MRI は外肛門括約筋内に浸潤および近接している症例を診断することがほぼ可能であり、外肛門括約筋浸潤あるいは近接症例の術前診断に有用であることが示唆された。

直腸癌手術において、その剥離面と腫瘍先進部との距離が 1mm 以下の症例ではそれ以上の症例に比べて有意に局所再発が増加する<sup>10,11)</sup>。そのため欧米では剥離面に癌浸潤が存在しない場合でも腫瘍先進部との距離が 1mm 以下の症例では周囲剥離断端 (Circumferential Resection Margin: 以下 CRM) 浸潤陽性とすることが多い<sup>12,13)</sup>。一方病理学的に直腸癌が外肛門括約筋内に浸潤することは今回の検討も含めて頻度は少なく<sup>8)</sup>、近接するに留まっていることが多い。しかし外肛門括約筋を完全に温存した場合には 1mm 以下に近接した症例は CRM 浸潤陽性に準じたものとなり、根治性を損なう可能性が高いと思われる。外肛門括約筋の温存の可能性を考える場合、1mm 以下に近接した症例は広義の外肛門括約筋浸潤として扱うべきと考える。

近年、MRI により深達度診断のみでなく、直腸癌切除の際 CRM 浸潤陽性となる症例を術前に診断することができ、その正診率は 90% 以上であることが報告されている<sup>13,15)</sup>。肛門管近傍の直腸癌においても同様の正確さで外肛門括約筋浸潤あるいは近接した症例を診断できることが望ましいが、今回の検討ではその正診率は 85% とやや低くなっている。今回の診断が諸家の CRM 浸潤陽性診断に比べて正診率が低いのは、肛門管近傍の解剖学的特性が影響していると考えられる。肛門管近傍の直腸は肛門管上部にて屈曲しているため外肛門括約筋と腫瘍との最短距離を描出するには、限られた Dimension での画像では限界があると思われる。また Peschaud らは下部直腸癌では CRM 浸潤に関する診断が上中部に比べて困難であることを報告しており、その理由とし

て下部直腸では直腸間膜内の脂肪層が菲薄することを挙げている<sup>16)</sup>。肛門管上部の屈曲および間膜内脂肪層の菲薄化が上中部直腸癌の CRM 浸潤の診断に比べ外肛門括約筋浸潤の診断をより困難にしている。

MRI における浸潤陽性所見は組織学的にどのような所見を捉えているのだろうか。MRI 陽性症例のうち外肛門括約筋内に癌の浸潤を認めた症例は 2 例のみであった。その他の陽性症例の大部分では外肛門括約筋の内部や近傍に炎症細胞の浸潤や線維化を認め、腫瘍周囲の炎症が外肛門括約筋に近接しているために起こる反応性変化を MRI にて観察していると考えられる。腫瘍周囲の炎症が強い症例では腫瘍と外肛門括約筋が離れていても外肛門括約筋に変化を及ぼすため偽陽性になる可能性がある。反対に周囲に炎症所見が非常に乏しい場合には、偽陰性となる可能性もある。今回の診断基準や撮影方法のみでは癌の浸潤と炎症による反応性変化を鑑別することは困難と思われる。

直腸癌の外肛門括約筋浸潤の MRI 診断に関する報告は現在までに 2 編のみである<sup>15,16)</sup>。いずれも外肛門括約筋内への浸潤を術前 MRI で 100% 予測することが可能と報告している。しかし癌と外肛門括約筋との距離を MRI 診断と対比した報告は今回の検討が初めてのものであり、MRI が外肛門括約筋近接症例の診断にも有用であることが判明したことは ISR の適応決定を行う上でも有意義と思われる。今後他の診断方法との併用や新たな MRI の診断基準により外肛門括約筋浸潤および近接症例の診断の精度を向上させることは、特に ISR の適応決定をより正確に行うために必要である。

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## Preoperative Assessment of External Anal Sphincter Invasion and Para-external Anal Sphincter Invasion in Rectal Cancer Using Magnetic Resonance Imaging

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**PURPOSE :** The aim of this study was to assess the accuracy of preoperative magnetic resonance imaging for the prediction of external anal sphincter invasion and para-external anal sphincter muscle invasion in lower rectal cancer patients.

**METHOD :** Twenty-six patients with lower rectal cancer who underwent curative abdomino-perineal resection were investigated. The para-external anal sphincter invasion was defined when tumor was observed within 1 mm from the inter rim of the external anal sphincter muscle. We established the criteria for external anal sphincter invasion on magnetic resonance imaging. Preoperative magnetic resonance imaging was compared with pathological results prospectively.

**RESULT :** External anal sphincter invasion was seen in only two patients, and para-external anal sphincter invasion was seen in 7 of the 26 patients histologically. Accuracy of preoperative magnetic resonance imaging for detecting external and para-external anal sphincter invasion was a sensitivity of 89% and a specificity of 82%.

**CONCLUSION :** Preoperative magnetic resonance imaging could be useful for detecting external and para-external anal sphincter invasion in rectal cancer patients.

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## GASTROINTESTINAL CANCER

# Positron emission tomography scanning is not superior to whole body multidetector helical computed tomography in the preoperative staging of colorectal cancer

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See end of article for authors' affiliations

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**Background:** The role of positron emission tomography with the glucose analogue [<sup>18</sup>F] fluoro-2-deoxy-D-glucose (FDG-PET) in the initial staging of disease in patients with primary colorectal cancer (CRC) has not been adequately assessed.

**Aims:** To evaluate the additional value of FDG-PET as a staging modality, complementary to routine multidetector row computed tomography (MDCT) in patients with CRC.

**Methods:** Forty four patients with CRC underwent preoperative MDCT and FDG-PET. The accuracy of intraoperative macroscopic staging was also investigated compared with histopathological diagnosis. All FDG-PET images were evaluated with respect to detectability of the primary tumour, lymph node involvement, and distant metastases. Both MDCT and FDG-PET diagnoses and treatment plan were compared with surgical and histopathological results.

**Results:** Thirty seven patients underwent surgery. Tumour detection rate was 95% (42/44) for MDCT, 100% (44/44) for FDG-PET, and 100% (37/37) for intraoperative macroscopic diagnosis. Pathological diagnosis of T factor was T1 in five, T2 in four, T3 in 24, and T4 in four cases. Concordance rate with pathological findings of T factor was 57% (21/37) for MDCT and 62% (23/37) for macroscopic diagnosis. Lymph node involvement was pathologically positive in 19 cases. Regarding N factor, overall accuracy was 62% (23/37) for MDCT, 59% (22/37) for FDG-PET, and 70% (26/37) for macroscopic diagnosis. For all 44 patients, FDG-PET findings resulted in treatment changes in only one (2%) patient.

**Conclusion:** FDG-PET is not superior to routine MDCT in the initial staging of primary CRC.

Colorectal cancer (CRC) is an important cause of morbidity and mortality in Japan as well as in other countries.<sup>1</sup> The prognosis of CRC directly relates to extramural tumour spread, ability to achieve surgical clearance, and the presence of lymph node and distant metastases.<sup>2,3</sup> Optimal management of individual patients requires detailed assessment of the locoregional and distant extent of disease.

Conventional preoperative staging of CRC has been abdominal computed tomography (CT) and chest radiography to rule out liver, lung, or lymph node metastases and invasion of the surrounding organs, respectively. The introduction of multidetector row CT (MDCT) has provided high resolution imaging and shortened examination time.<sup>4</sup> This becomes an effective diagnostic technique in the evaluation of preoperative staging of CRC.

Positron emission tomography with the glucose analogue [<sup>18</sup>F] fluoro-2-deoxy-D-glucose (FDG-PET) is a sensitive diagnostic test that images tumours based on increased utilisation of glucose by tumour cells.<sup>5,6</sup> FDG-PET has been demonstrated to be more sensitive than conventional imaging in the detection of recurrent or metastatic CRC.<sup>7-13</sup> One meta-analysis revealed an overall sensitivity of 97% and an overall specificity of 76% for FDG-PET in detecting recurrent CRC.<sup>14</sup>

However, reports of FDG-PET in the staging of primary CRC are few.<sup>15-18</sup> Also, these studies had several limitations: patient numbers were small,<sup>15,16</sup> or diagnostic accuracy of FDG-PET was compared with conventional abdominal CT<sup>17</sup> or CT was performed at a different hospital.<sup>18</sup> Comparison of state of the art FDG-PET with CT using variable techniques

and qualities is not meaningful. Thus the role of FDG-PET in the initial staging of disease in patients with primary CRC has not been fully investigated to date.<sup>19</sup>

The purpose of this study was to prospectively evaluate the additional value of FDG-PET as a staging modality complementary to routine MDCT in patients with primary CRC. In patients undergoing surgery, the accuracy of intraoperative macroscopic staging was also investigated compared with histopathological diagnosis, as well as preoperative imaging results. All studies were performed in one Japanese hospital.

## METHODS

### Patients

Between September 2002 and January 2004, 44 consecutive patients with CRC who approved of this study were enrolled after giving written informed consent in accordance with the regulations of the institutional review board. There were 33 men and 11 women with a mean age of 61.4 years (range 38-82). The primary tumour originated from the right colon (n=2), sigmoid colon (n=4), or rectum (n=38). Histological diagnosis was performed in all patients by colonoscopy. All patients underwent preoperative MDCT and FDG-PET within one month (median 9 days (range 0-26)).

**Abbreviations:** PET, positron emission tomography; FDG-PET, [<sup>18</sup>F] fluoro-2-deoxy-D-glucose-positron emission tomography; CRC, colorectal cancer; CT, computed tomography; MDCT, multidetector row computed tomography

### MDCT

The diagnosis and location were established by barium enema and/or colonoscopy before CT scanning. The time interval between barium enema and/or colonoscopy and MDCT was  $\leq 1$  week. No specific preparation, such as laxatives, enema, or oral contrast agents, was performed before MDCT examination.

We used an Aquiline 16 CT scanner (Toshiba Medical Systems, Tokyo, Japan). For imaging of the whole body, we used the 16 high resolution central detectors. From these detectors we selected a 2 mm slice thickness and reconstructed the data at 5 mm intervals. Other parameters were a 0.5 second helical rotation time, 135 kVp, and 300 mAs. Iopamidol 100 ml (Iopamiron; Nihon Schering, Tokyo, Japan) was administered through a peripheral venous line at 3 ml/s using a power injector (Autoenhance A-50; Nemoto Kyorindo, Tokyo, Japan). CT scanning began 120 seconds after the start of injection of the contrast medium and scan data were acquired from the neck to the upper femur within one breathhold in approximately 20 seconds. Multiplanar reformation was reconstructed by a freestanding workstation (ZAI0, Tokyo, Japan) if diagnostic radiologists considered it necessary.

### FDG-PET

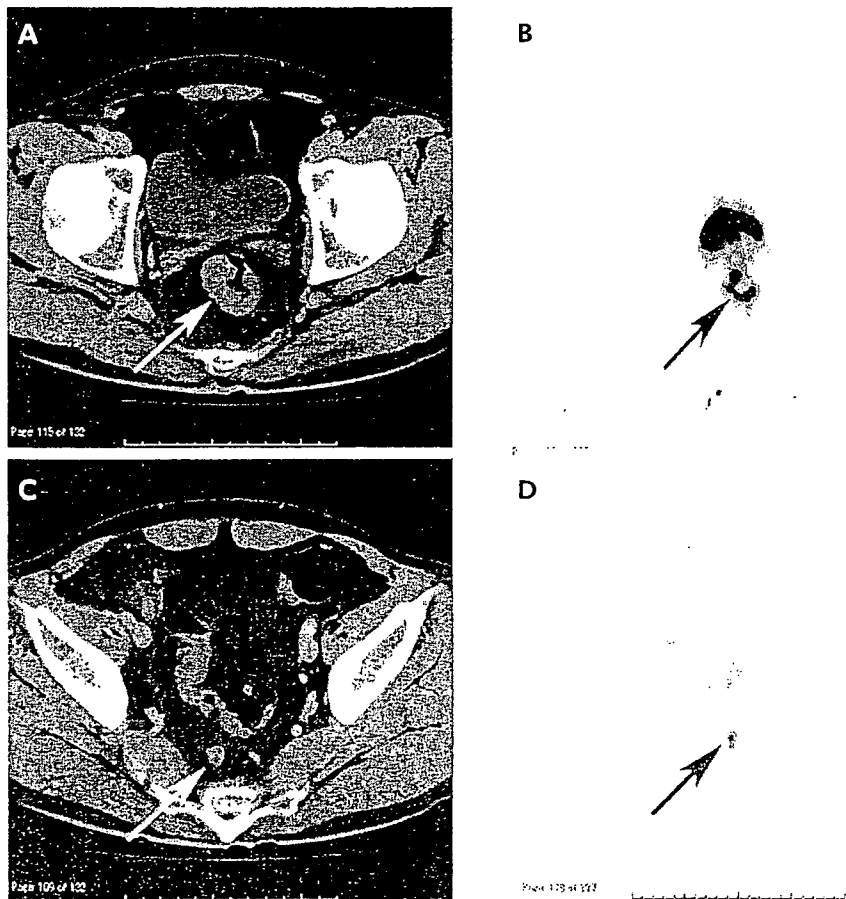
Patients fasted for at least four hours before the examination. Patients received an intravenous injection of 200–250 MBq of [ $^{18}\text{F}$ ] fluoro-2-deoxy-D-glucose and then rested for approximately 60 minutes before undergoing imaging. Image acquisition was performed with use of an Advance NXi (GE Medical Systems, Milwaukee, Wisconsin, USA). Two

dimensional emission scanning from the groin to the base of the skull (6–7 bed positions) was performed, lasting five minutes per bed position, in combination with a transmission scan lasting 1.5 minutes per bed position (transmission scanning time was corrected to allow for decay of the transmission sources). Data acquired were reconstructed by iterative ordered subsets expectation maximisation (21 subsets, two iterations).

### Image analysis

At first, MDCT images were prospectively evaluated by two radiology physicians in consensus. They were assessed for detectability of the tumour, depth of tumour infiltration (T factor), regional lymph node involvement (N factor), and distant metastasis (M factor).

T factor on MDCT was defined by a modified TNM stage: tumour confined to the bowel wall was classified as T1 or T2. T1 was defined as an intraluminal elevated mass without thickening of the bowel wall. T2 was defined as thickening of the bowel wall ( $>5$  mm) without invasion into the surrounding tissue. Tumour exposed out of the bowel wall but with no extension to the surrounding organs was considered as T3. Tumour infiltration into adjacent organs was considered T4. Lymph nodes were considered positive when the short axis was greater than 1 cm in diameter or there were clusters of three or more smaller nodes (each  $<1$  cm). Lesions in the liver not characteristic of a cyst or haemangioma were considered suspicious of metastases. Also in the lung, pulmonary nodules without calcification were regarded as suspicious of metastases.



**Figure 1** (A) Primary rectal tumour was exposed to the rectal wall but no extension to the pelvic side walls on computed tomography (CT) (arrow). (B) At the same level as (A), avid uptake was demonstrated on positron emission tomography (PET) (arrow). (C) A superior rectal lymph node was greater than 1 cm on CT (arrow). (D) At the same level as (C), PET showed uptake corresponded to the lymph node demonstrated on CT (arrow). This case was preoperatively diagnosed as TNM stage T3N1 and confirmed at surgery and on histopathological examination.

**Table 1** Comparisons of MDCT and macroscopic diagnosis in staging depth of tumour invasion with colorectal carcinoma

Pathological staging	MDCT diagnosis					Macroscopic diagnosis			
	Tx	T1	T2	T3	T4	T1	T2	T3	T4
T1	2	0	2	1	0	1	4	0	0
T2	0	0	1	3	0	1	0	3	0
T3	0	0	5	17	2	0	3	18	3
T4	0	0	0	1	3	0	0	0	4

MDCT, multidetector row computed tomography.

All FDG-PET images were interpreted with knowledge of the patient's medical history and MDCT findings, and were evaluated with respect to detectability of the primary tumour, lymph node involvement, and distant metastases by two nuclear radiology physicians. T factor was not evaluated because the layers of intestinal wall and neighbouring structures cannot be differentiated on FDG-PET. Uptake higher than background was considered to be increased. Physicians interpreted the FDG-PET images by visually correlating the FDG-PET and MDCT images (fig 1). This approach was chosen because it represents the routine practice of combined reading of FDG-PET and MDCT images in our hospital. On the basis of their visual correlation, physicians assigned a TNM stage on FDG-PET. Regarding N factor, we chose to analyse the imaging studies on a nodal station bases and not on an individual lymph node basis. It seemed impossible for us to make a precise correlation between individually sampled and mapped lymph nodes on imaging studies.

#### Preoperative staging decision

Both MDCT and FDG-PET results were presented at the colorectal cancer conference, comprising surgeons, medical oncologists, endoscopists, nuclear radiology physicians, and radiation oncologists. All conference members confirmed the MDCT and FDG-PET findings. When a clear differentiation between different tumour stages on MDCT and FDG-PET was not possible, both stages were noted and confirmed after surgery. Based on the consensus of the conference, patients were divided into two groups. Patients considered as unresectable were referred to the Division of Gastrointestinal Medical Oncology, where chemotherapy, chemoradiotherapy, or best supportive care was performed. If unresectable factors were negative, the patient was admitted to a surgical ward and curative resection was attempted. In our hospital, neoadjuvant therapy was not routinely performed. These decisions on diagnosis and treatment plan were recorded and compared with surgical and pathological results.

#### Macroscopic diagnosis

For the 37 patients who proceeded to surgery, detection of the primary tumour, its depth of invasion, lymph node status, and liver metastases were macroscopically diagnosed either

during surgery or through a node collection and classification procedure immediately after resection. These procedures were performed with knowledge of the preoperative imaging findings.

#### Data analysis

Resected specimens were examined by pathologists without knowing the preoperative MDCT and FDG-PET findings. The diagnostic accuracy of MDCT, FDG-PET, and macroscopic diagnosis of T and N factors were assessed using the histopathological findings as the gold standard. Comparison of diagnostic and pathological parameters was performed using the McNemar test. The level of statistical significance was determined at 5% in all cases.

#### RESULTS

All 44 patients tolerated both MDCT and FDG-PET examinations without any complications. Based on both MDCT and FDG-PET, 10 lesions of distant metastases were revealed in five patients and defined as unresectable: three bone metastases, three lung metastases, two liver metastases, and two distant lymph node metastases. MDCT showed eight of these 10 lesions; one each of bone and distant lymph node metastasis were missed. FDG-PET showed nine of the 10 lesions; one lung metastasis was missed. These five patients did not undergo surgical resection. Two patients were refused any anticancer treatment and left our hospital although their tumours were potentially resectable. Thus the remaining 37 patients were defined as resectable and underwent surgery. As expected, all lesions were resected with regional lymph node dissection.

The tumour detection rate was 95% for MDCT, 100% for FDG-PET, and 100% for intraoperative macroscopic diagnosis. The two cases which were not detected on MDCT were 0.7 cm and 1.8 cm adenocarcinomas, both limited to the submucosal layer. Regarding T factor, concordance rate with pathological findings was 57% for MDCT and 62% for macroscopic diagnosis (table 1). The difference was not significant ( $p = 0.813$ ). In three of seven cases, tumours were diagnosed as T4 at surgery but histopathologically with no evidence of invasion to the adjacent organ. In contrast, in one case, MDCT showed no evidence of invasion to the adjacent organ but the tumour was found to have invaded the vagina

**Table 2** Comparisons of MDCT, PET, and macroscopic diagnosis in staging lymph node metastasis with colorectal carcinoma

	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Accuracy (%)
MDCT	58 (11/19)	67 (12/18)	65 (11/17)	60 (12/20)	62 (23/37)
PET	37 (7/19)	83 (15/18)	70 (7/10)	43 (15/27)	59 (22/37)
Macroscopic diagnosis	68 (13/19)	72 (13/18)	72 (13/18)	68 (13/19)	70 (26/37)

MDCT, multidetector row computed tomography; PET, positron emission tomography.

at surgery and combined resection was performed. Invasion was confirmed histopathologically.

Regarding N factor, overall accuracy was 62% for MDCT, 59% for FDG-PET, and 70% for macroscopic diagnosis (table 2). Sensitivity, specificity, positive predictive value, and negative predictive value were calculated as 58%, 67%, 65%, and 60%, respectively, for MDCT; 37%, 83%, 70%, and 43%, respectively, for FDG-PET; and 68%, 72%, 72%, and 68%, respectively, for macroscopic diagnosis. Macroscopic diagnosis showed a slightly higher accuracy but values were not significantly different between these modalities ( $p = 0.624$  for MDCT  $\nu$  macroscopic diagnosis;  $p = 0.466$  for FDG-PET  $\nu$  macroscopic diagnosis).

Of the 44 patients, FDG-PET findings resulted in treatment changes in only one (2%) patient who had bone and distant lymph node metastases detected only by FDG-PET. Although MDCT detected lung metastases that were not demonstrated on FDG-PET in one case, the patient had other distant metastases and the treatment plan was not influenced by the MDCT findings.

## DISCUSSION

CT examination is an established method for staging colorectal carcinoma. However, recent studies have shown low accuracy rates due to considerably low sensitivity for detection of lymph node metastases and for local tumour extension.<sup>20-23</sup> MDCT is expected to improve diagnostic accuracy by scanning a wider region with better resolution. To evaluate the usefulness of FDG-PET, we compared the diagnostic accuracy of FDG-PET with this up to date technology.

The efficacy of imaging techniques is usually evaluated by retrospective reading by radiologists blinded to the clinical information. However, this is not practical and many physicians often feel that actual diagnostic results are different from the results reported. We wished to evaluate the usefulness of FDG-PET in the clinical setting. Recently, integrated PET-CT scanners have been introduced into the clinical situation.<sup>24</sup> Using this technique, PET, CT, and integrated PET-CT images are displayed together on the monitor. This type of PET scanner and reading style will become routine. Thus in this study, FDG-PET images were interpreted with knowledge of the patient's medical history and MDCT images.

For detection of a primary tumour, FDG-PET was positive in all 44 lesions but MDCT gave two false negative lesions. We did not use any preparation before the MDCT studies. If sufflation of air or water into the bowel cavity and administration of antiperistaltic drug had been performed, the detection rate might have been improved. In contrast, FDG-PET was positive in all lesions, including those that were negative with MDCT. Such high sensitivity confirms the results of previous reports.<sup>15-17</sup> The injected dose that we used was lower than the conventional dose reported. However, we had confirmed in our preliminary study that image quality with this dose did not deteriorate. This may have been due to differences in the physique of Japanese and Western patients. We should try to reduce radiation exposure while preserving diagnostic accuracy.

CT studies over the last decade showed accuracy rates of 41-82% in T staging.<sup>20-23</sup> Our result (57%) was comparable with these reports. Even with the improved imaging resolution of MDCT, it is still difficult to discriminate bowel wall layers as conventional single detector spiral CT. MDCT did not demonstrate satisfactory results for diagnosis of N factor, as reported in previous studies.<sup>25-27</sup> Microscopic metastasis or uninvolved swelling of lymph nodes results in misdiagnosis. As long as a diagnosis is made based on the size of lymph nodes, a certain percentage of false positive and

negative lymph nodes is unavoidable. In this study, FDG-PET had low sensitivity (37%) and high specificity (83%), as reported in previous studies.<sup>16-18</sup> FDG-PET was no better than MDCT. The high false negative rate was attributed to limited spatial resolution, which was a disadvantage in detecting micrometastases, and the proximity of the dose to the primary tumour to lymph node metastases.

The accuracy of intraoperative macroscopic diagnosis was superior but not significantly different from that of MDCT and FDG-PET. By palpation and inspection, lymph nodes in the immediate vicinity of the primary tumour could be differentiated more easily than by MDCT or FDG-PET. Moreover, macroscopic diagnosis was made with knowledge of the MDCT and FDG-PET findings. Nevertheless, accurate diagnosis of lymph node metastasis is difficult, even at surgery.

FDG-PET has the advantage of studying the whole body at one examination and synchronous tumours have been identified on FDG-PET. However, MDCT can also scan the whole body in a shorter time than FDG-PET. In this study, distant metastases revealed only 10 lesions in five patients. While patient numbers were too small to compare the usefulness of the diagnostic modalities, MDCT and FDG-PET showed various corresponding metastatic lesions.

In assessing the influence of FDG-PET findings on clinical management, changes in therapeutic decision making were made in only 2% (1/44) of cases, which is less than in other investigations. The incidence of management alterations due to FDG-PET was reported as 16-50%.<sup>8 13 18 28 29</sup> The reason may be selection of patients in the other studies as many were already known to have advanced disease and FDG-PET was performed to detect recurrences or metastases.

The results of this study suggest that the diagnostic accuracy of FDG-PET for the initial staging of CRC was not superior to routine MDCT and was not influential in terms of patient management. We believe routine evaluation of patients with a suspicion of CRC by FDG-PET is not necessary; it should be performed on selected patients who have suggestive but inconclusive metastatic lesions with other modalities.

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# Colonic J-Pouch Decreases Bowel Frequency by Improving the Evacuation Ratio

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**KEY WORDS:**  
Colonic J-pouch;  
Defecography;  
Transit study;  
Evacuation ratio;  
Contraction ratio

## ABSTRACT

**Background/Aims:** To compare the functional outcome of ultra-low anterior resection for rectal cancer with colonic J-pouch reconstruction with that of straight reconstruction.

**Methodology:** Twenty-three patients who underwent ultra-low anterior resection with or without J-pouch reconstruction underwent bowel transit study, videodefecography, and answered a questionnaire survey 4 months and 1 year after surgery. Eleven healthy subjects underwent similar testing as controls.

**Results:** Patients with a J-pouch had less frequent stools than patients with straight reconstruction 4 months after surgery ( $p < 0.05$ ), but the two groups were similar at 1 year. Bowel transit time was similar at both study points. The evacuation ratio was

higher after J-pouch than straight reconstruction 4 months after surgery ( $p < 0.05$ ). However, the ratio improved in the straight group, and no difference existed at 1 year. Colonic contraction was seen only near the anastomosis 4 months after surgery, but the contraction proximal to the anastomosis improved over the next 8 months.

**Conclusions:** J-pouch reconstruction facilitates evacuation by improving the evacuation ratio. Although straight anastomosis caused excessive stool frequency 4 months after surgery, colonic function continued to improve and was comparable with J-pouch and straight reconstruction 1 year after surgery because the contraction ratio proximal to the anastomosis improved.

## INTRODUCTION

Generally, ultra-low anterior resection for rectal cancer avoids the need to create a permanent colostomy, but it often results in excessive stool frequency which decreases the quality of life. It has been reported that functional outcome after low anterior resection for rectal cancer can be improved by the construction of a colonic J-pouch. However the reasons for this improvement are poorly understood. Therefore construction of a colonic J-pouch is a controversial procedure, and its use varies from institution to institution.

This study compared the functional outcome of ultra-low anterior resection with and without colonic J-pouch reconstruction using new indicators of bowel function termed the evacuation ratio and the contraction ratio.

## METHODOLOGY

Between April 1999 and March 2001, ultra-low anterior resection with the primary anastomosis (<4cm above the dentate line) was performed in 23 rectal cancer patients. Patients were assigned randomly to the J-pouch with a 5-cm limb ( $n=13$ ) or to the straight anastomosis ( $n=10$ ) by a computer-generated table of random numbers. Informed consent was obtained from all patients.

Patients in the two groups were similar with respect to age, gender, distance between the anastomosis and the dentate line, nerve preservation, and Dukes stage (Table 1).

Bowel function was evaluated by a bowel transit study, a videodefecography, and a questionnaire administered before surgery, 4 months and 1 year after surgery.

### Bowel Transit Study

Twenty radiopaque markers within a gelatin capsule (Sitzmarks: Kongsyl Pharmaceuticals, U.S.A.) were ingested, and a plain film of the abdomen was taken 8, 24, 32, 48, and 96 h after ingestion. The half-dose transit method was used, and segment transit time for each segment of the colon was calculated before surgery and 4 months after surgery. Each segment was defined as follows; Ascending colon: A, Transverse colon: T, Descending colon: D, Sigmoid colon and (neo) Rectum: SR.

### Videodefecography

Thick barium sulfate of standardized consistency and viscosity was introduced into the (neo) rectum using a caulking gun injector until the contrast reached the sacral promontory (approximately 120g). Evacuation was videotaped fluoroscopically with the

patient in the sitting position.

The weight of infused contrast (W1) and evacuated contrast in 1 minute (W2) were recorded. The evacuation ratio was given by calculating  $W2/W1 \times 100(\%)$ . The contraction ratio (CR) was the post-evacuation diameter of the colon divided by the pre-evacuation diameter ( $\times 100(\%)$ ) which were calculated by lateral view of pelvic X-ray. The CR was calculated 5, 10, and 15cm above the anastomosis (CR5, CR10, and CR15, respectively).

Videodefecography was taken only postoperation (4 months and 1 year after surgery) because the examination was prevented by the existence of the tumor preoperation, so eleven healthy volunteers underwent the same examination and served as normal controls.

### Questionnaire Survey

A questionnaire was administered 4 months and 1 year after surgery inquiring as to the number of bowel movements per day, fecal soiling, and urgency.

Student's *t* test was used for intergroup comparisons. *P* values less than 0.05 were considered significant.

## RESULTS

### 1. Relationship between Bowel Frequency and Results of the Examination

The patients were divided into two groups to evaluate a relationship between bowel transit time and bowel frequency: high frequency ( $>5$  bowel movements per day) and low frequency. The left colonic transit time was longer in patients in the high bowel frequency group than those in the low (Figure 1).

There was a tendency towards an inverse correlation between the evacuation ratio by videodefecography and the number of bowel movements per day. The patients with a low evacuation ratio tended to have more frequent stools (Figure 2).

### 2. Comparison of Colonic Function between J-Pouch and Straight Reconstruction

Patients who underwent J-pouch reconstruction had fewer stools per day than patients who received straight reconstruction 4 months after surgery, but the two groups were similar at 1 year. Soiling and urgency were similar at both sampling points (Table 2).

The bowel transit time was longer postoperatively than it was preoperatively, especially in the left colon (D, SR), and that was similar in the two groups postoperatively (Figure 3).

Patients with a J-pouch had a higher evacuation ratio (71%) than patients with a straight reconstruction (48%) 4 months after surgery. At 1 year, however, the two groups were similar (Table 3).

The contraction ratio at different distances proximal to the anastomosis shows that powerful contractions occurred only near the anastomosis (CR5). The CR5 in J-pouch patients was higher than it was in patients with a straight reconstruction. One year after

TABLE 1 Patients' Characteristics

	Type of reconstruction		
	J-pouch (n=13)	Straight (n=10)	
Age (yr)	55±10	64±9	(ns)
Gender ratio (M:F)	7:6	6:4	(ns)
Distance from dentate line (cm)			
anterior wall	2.6±1.2	2.4±1.2	(ns)
posterior wall	2.0±1.5	2.3±1.2	(ns)
Nerve preservation			
hypogastric nerve	complete : 4, partial : 0	complete : 4, partial : 0	(ns)
pelvic plexus	complete : 5, partial : 7	complete : 6, partial : 3	(ns)
Dukes stage (A:B:C:D)	6:1:5:1	3:1:6:0	(ns)

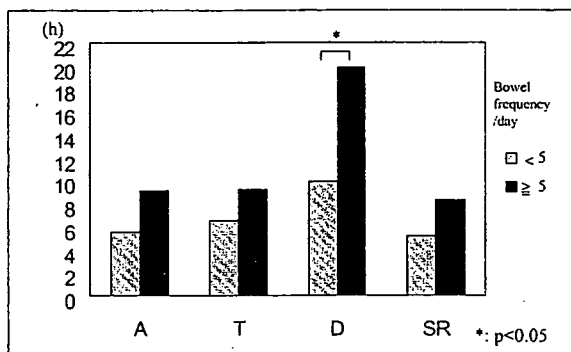


FIGURE 1 Segmental transit time between high and low bowel frequency group. Each segment was defined as follows; Ascending colon: A, Transverse colon: T, Descending colon: D, Sigmoid colon and (neo) Rectum: SR. The left colonic transit time was longer in patients in the high bowel frequency group ( $>5$  bowel movements per day) than in patients in the low.

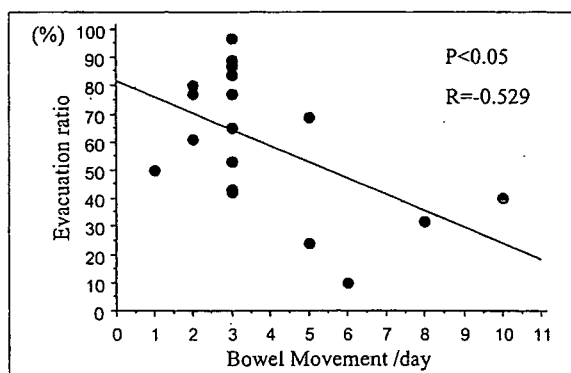


FIGURE 2 Relationship between evacuation ratio and bowel frequency. There was a tendency towards an inverse correlation between the evacuation ratio and the number of bowel movements per day. The patients with a low evacuation ratio tended to have more frequent stools.

surgery, CR5, CR10 and CR15 in straight reconstruction patients both were higher than they were 4 months after surgery (Table 3).

## DISCUSSION

The introduction of stapling devices has improved the safety of ultra-low anterior resection for rectal cancer. However, the ability of the rectum to function as a stool-reservoir decreases in proportion to the amount of rectum removed, and conventional low anterior resection can result in dyschezia. Lazorthes

TABLE 2 Postoperative Functional Results

	Stool frequency (/day)		Soiling (%)		Urgency (%)	
	J-pouch	Straight	J-pouch	Straight	J-pouch	Straight
4M	3.0*	6.2*	31	20	0	20
8M	3.2**	6.2**	15	0	0	0
1Y	2.7	2.5	0	0	0	0

\*, \*\*:  $p < 0.05$ .

J-pouch (n=13), Straight (n=10).

TABLE 3 Evacuation Ratio and Contraction Ratio

Period	ER (%)	CR5 (%)	CR10 (%)	CR15 (%)
Control	89±12* <sup>1</sup>	50±16* <sup>2</sup>	31±15* <sup>3,4,5</sup>	33±5* <sup>6,7</sup>
J-pouch	4M	71±19	52±24	16±10* <sup>3</sup>
	1Y	77±19	50±15	5±2* <sup>4</sup>
Straight	4M	48±21* <sup>1</sup>	31±10* <sup>2</sup>	7±4* <sup>5</sup>
	1Y	70±24	47±21	21±3

\*<sup>1-6</sup>  $p < 0.05$ .

ER: Evacuation ratio, CRx: contraction ratio x cm above the anastomosis.

Control values were derived from 11 healthy volunteers.

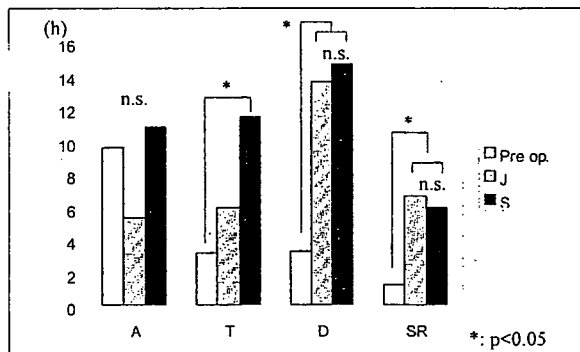


FIGURE 3 Segment transit time between J-pouch and straight reconstruction. The bowel transit time was longer postoperatively than it was preoperatively, especially in the left colon (D, SR). Bowel transit time was similar in patients with J-pouch and straight reconstruction.

(1) and Parc (2) reported in 1986 that colonic J-pouch improves postoperative rectal function. Hida *et al.* (3) recommended that a J-pouch be constructed when the anastomosis is <8cm from the anal verge because a satisfactory functional outcome can be obtained with straight reconstruction when the distance is >9cm. In recent years, a small J-pouch, with a 5 or 6-cm limb, has been recommended because it is difficult to evacuate a large pouch (4-7). Based on these recommendations, we used a J-pouch reconstruction with a 5-cm limb when the anastomosis was <4cm above the dentate line in this study.

It has been reported that J-pouch reconstruction improves rectal compliance (8), reduces the frequency

of strong contractions (9), and increases the anorectal pressure gradient (9,10), all of which improve function.

We used a colonic transit study with radiopaque markers to evaluate motor activity of the colon. The reproducibility of this method has been validated (11). The postoperative bowel transit time was longer than in healthy controls, especially in the left colon, and corresponded to excessive stool frequency. These results suggest that the bowel frequency is related to the transit time of the left side colon.

In videodefecography, evacuation ratio and contraction ratio were obtained to evaluate the evacuation function of the colonic segment above the anastomosis. Also patients with a low evacuation ratio tended to have more frequent stools (12). Decreased motor activity of the colon proximal to the anastomosis prolongs the transit time and decreases the evacuation ratio (13). Denervation (14), poor blood supply (15), and the appearance of strong contractions (15,16) are thought to be causes of decreased motor activity after low anterior resection, and contribute to dyschezia.

The motor activity proximal to the anastomosis was decreased at 4 months regardless of whether a J-pouch was constructed. Contraction of the colon occurred only near the anastomosis. However the evacuation ratio was higher when a J-pouch was constructed. These results show that the J-pouch does not improve colonic transit time, but decreases stool frequency by facilitating fuller evacuation during each bowel movement.

It has been reported that the advantages of J-pouch over straight reconstruction are short-term and that the functional results are similar after 1 or 2 years (17,18). Our study reproduced this finding. Interestingly, the CR10 and CR15 were both higher at 1 year than they were 4 months after surgery in both groups. Improvement has been attributed to recovery of the nerve function (18) and reduction in the frequency of strong contraction (15), but further study is needed to clarify the cause of dyschezia after ultra-low anterior resection.

## CONCLUSIONS

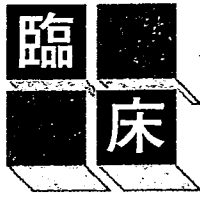
Decreased motor activity of the colon proximal to the anastomosis increases stool frequency after ultra-low anterior resection. Colonic J-pouch reconstruction did not improve colonic transit time, but did decrease stool frequency secondary to an improvement in the evacuation ratio. Stool frequency in patients with a straight reconstruction decreased during the first year after surgery because the contraction ratio proximal to the anastomosis improved.

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## 直腸癌側方リンパ節郭清の現状と今後

*Now and future of lateral lymph node dissection for advanced lower rectal cancer*

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直腸癌に対する側方リンパ節郭清は、時代の変遷とともに自律神経全温存が標準となり合併症も少なく安全な手技になってきた。一般的な郭清の適応は、腫瘍下縁が腹膜反転部より肛門側にあり、かつ、深達度 A 以深、直腸間膜内リンパ節転移陽性である。また、大腸癌治療ガイドラインには、郭清により骨盤内再発リスクは50%減少し5年生存率は9%改善すると、その有用性が明記されている。しかしながら、現行の適応は直腸間膜内の側方転移危険因子に基づくものであり、今後の課題として、直接的な側方転移診断精度の向上とそれに伴う郭清の効率化があげられる。さらに、この手術手技を広く標準化するためには、外科的教育システムを構築する必要がある。

### はじめに

進行直腸癌に対する側方リンパ節郭清(以下、側方郭清)はわが国独自の手術手技であるが、残念ながら欧米から広い支持を得ているとはいえない。自律神経機能廃絶時代の悪夢を克服できずに現在に至っている感がある。しかしながら、わが国における膨大なリンパ節のマッピングデータから転移のターゲットとなるリンパ節が解剖学的に明らかになり、とくに自律神経については非温存から全温存へと時代の要請とともに変化してきている。また実際の現場では手技の向上や器械の進歩から安全な郭清が可能となっている。

本稿では過去の暗黒時代を原体験していない筆

者が若手外科医として側方郭清の現状と今後の課題について検討を加えた。

### I. 欧米の拡大郭清とわが国の側方郭清の相違

欧米の拡大郭清とわが国の側方郭清の相違を正しく認識することは、相互理解を深める鍵でもあり現行の TNM 分類を正しく理解するうえでも重要である。直腸癌における最初の根治手術は1908年に提唱された Miles 手術である。以降、欧米では Miles の郭清範囲をもとに局所再発率を下げるべく拡大郭清が行われた。具体的な郭清範囲は、高橋<sup>1)</sup>が示しているように1985年の Glass

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**Key words**: 直腸癌/自律神経温存/側方郭清

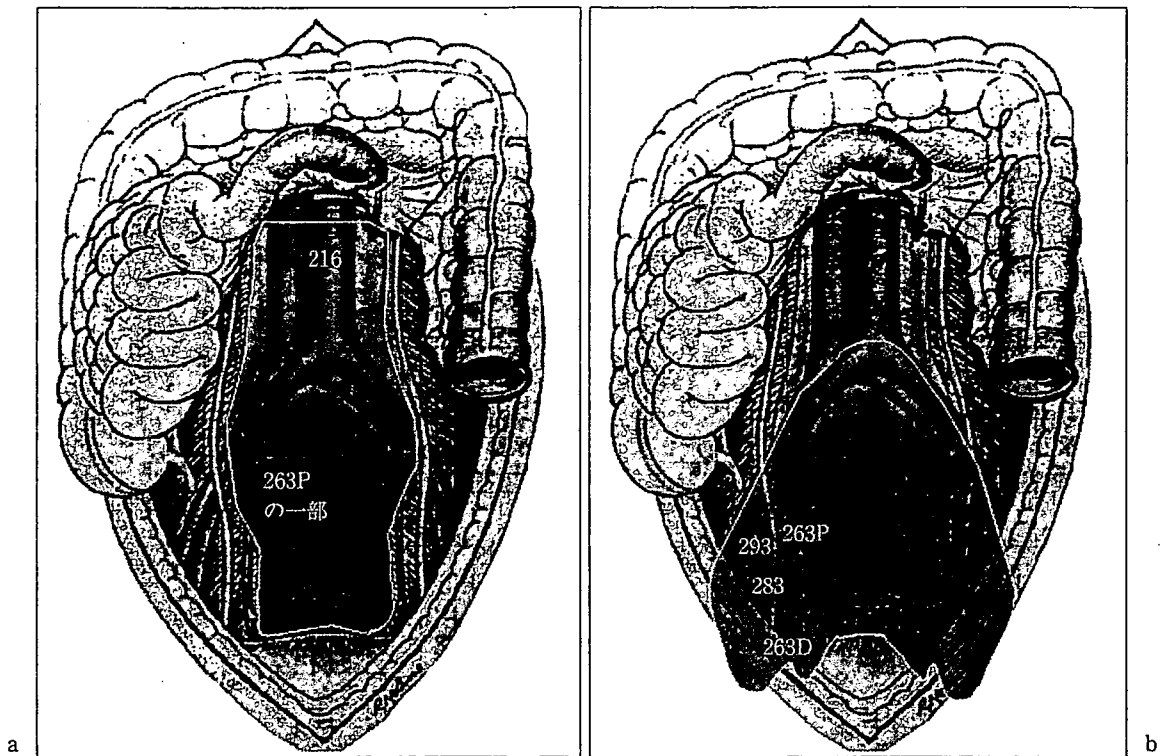


図1 直腸癌に対する欧米の拡大郭清(a)とわが国の側方郭清(b)の郭清範囲の相違 (文献2より引用, 改変)

表1 TNM分類における直腸癌の所属リンパ節 (文献3より抜粋)

Regional Lymph Nodes	
For each anatomic site or subsite the following are regional nodes :	
Rectum	superior, middle, inferior rectal (haemorrhoidal)
	inferior mesenteric
	<b>internal iliac</b>
	mesorectum (paraproctal)
	lateral sacral, presacral, sacral promontory (Gerota)
Metastasis in nodes other than those listed above is classified as distant metastasis.	

の論文<sup>2)</sup>が理解しやすい。GlassはSt Mark's病院で30年以上にわたって行われた拡大術式をradical resection and extended abdomino-iliac lymphadenectomyとして紹介している。郭清範囲を大腸癌取扱い規約(第7版)に準じて検討してみると、わが国の側方郭清との相違は図1aのように、①その名の通り大動脈と下大静脈リンパ節216の郭清が中心である。②内腸骨リンパ節の中樞側263Pは郭清範囲に含まれているが一部であり、末梢側263Dは含まれていない。③閉鎖リンパ節283と外腸骨リンパ節293は含まれていない。一方、わが国の側方郭清は図1bのように、

263P, 263D, 283, 293のリンパ節郭清はほぼ必須であり、216の郭清は不要である。このような歴史的な背景を考慮して現行のTNM分類<sup>3)</sup>における直腸癌の所属リンパ節を見てみると、そこには閉鎖リンパ節283や外腸骨リンパ節293は当然含まれず、表1のinternal iliac(内腸骨リンパ節)とはGlassの論文から推測すると263P(内腸骨リンパ節中枢)の一部に相当する領域であり263D(内腸骨リンパ節末梢)は含まれていないと考えるのが妥当である。また、TNM分類に示されているように所属リンパ節以外のリンパ節転移を遠隔転移と定義すると、263D, 283, 293へのリンパ

節転移は遠隔転移となり、その領域に生じた再発は局所再発と定義されないことになる。つまり欧米の拡大郭清とわが国の側方郭清とでは郭清範囲は明らかに異なり、そこから導きだされる局所再発率、生存率などの臨床データを一律に比較検討することは困難であり、論文を読む際には注意を要する。

## II. 進行直腸癌における自律神経全温存術の妥当性

直腸癌手術における自律神経の取扱いは非温存、部分温存から全温存へと次第に推移してきている。これは外科医が術後のQOL向上を目指したためであろうが、神経温存の有無と局所再発の関係を厳密に比較検討した報告はなく、実際には温存しても局所再発率は上がらなかった、あるいは画像的に温存した神経周囲の局所再発は少なかったなどという報告が多い。そこで、すでに神経全温存を標準術式として取り入れていたわれわれは進行直腸癌20例を対象に骨盤神経叢周囲の結合織を1症例に4検体(計78検体)採取して、神経叢周囲の微小転移の有無をHE染色よりも鋭敏なRT-PCR法を用いて検討した<sup>4)</sup>。表2に結果を示

表2 直腸癌骨盤神経叢周囲の微小転移

進行度	症例数	上方LN (HE)	骨盤神経叢周囲微小転移	側方LN (HE)
I	4	0	0(0/16)*	0
II	7	0	0(0/28)	0
III	6	6	0(0/24)	2
IV	3	3	2(2/10)	3
	20	9	2(2/78)	5

\*微小転移陽性数/検体数

す。20例中9例に上方転移を、5例に側方転移を認め、側方転移例はすべて上方転移を伴っていた。Stage IVの遠隔転移部位は肝2例、大動脈リンパ節転移1例の3例であり、すべての症例で根治B以上の手術が可能であった。われわれの予想に反して、微小転移は78検体中2検体(3%)と低率であった。また微小転移は遠隔転移を伴うStage IVの2例にのみ存在した。リンパ節転移との関係では、上方リンパ節転移のみのStage IIIの4例に微小転移はなく、上方転移と側方転移を伴ったStage IIIの2例とStage IVの3例の計5例中2例にのみ微小転移が存在した。上方および側方転移を伴ったその他の3例に骨盤神経叢周囲の微小転移が存在しなかったという事実は、図2に示すように、下部直腸癌の側方リンパ節転移の成

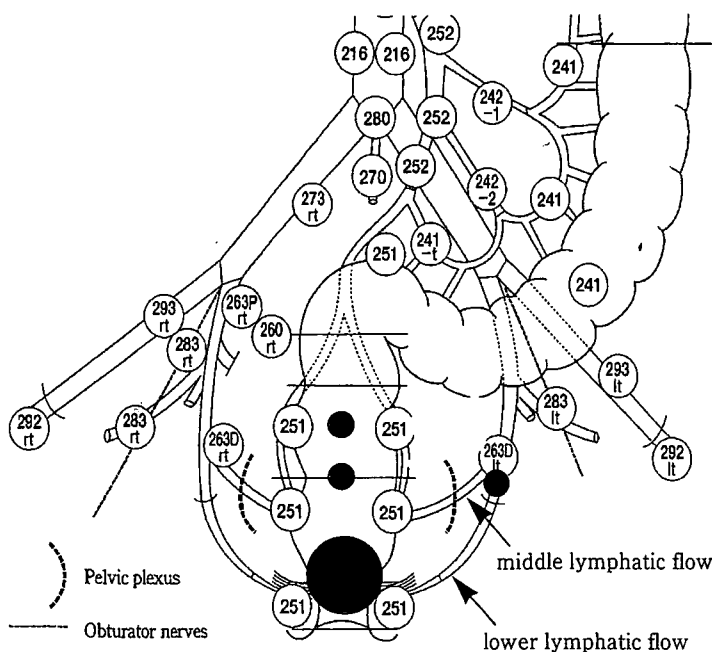


図2 側方領域への転移経路としてのリンパ流

上方および側方転移を伴い骨盤神経叢周囲の微小転移が存在しなかった3症例では、側方転移経路として直腸のlower lymphatic flowの重要性が示唆された。大きい●は主腫瘍、小さい●は転移リンパ節。