4. センチネルリンパ節生検と腋窩リンパ節郭清

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はじめに

乳癌の初期治療は，画像診断と針生検などの組織診断に基づいた臨床病期に応じて手術あるいは薬物治療が先行する．このうち，手術は乳房と腋窩の2つの治療部位に大別される．腋窩手術について，非浸潤癌である0期では，理論的にメスを入れる必要はない．臨床的にリンパ節転移陰性（N0）で腫瘍径5cm以下の浸潤癌であるⅠ期またはⅡA期では，病理学的にリンパ節転移の有無を診断するためにセンチネルリンパ節生検が行われる．ⅡB期以上では，手術先行にせよ薬物治療先行にせよ，半数以下の症例で腋窩リンパ節に転移を認める（N+）ため，腋窩リンパ節郭清が標準的である．

センチネルリンパ節生検

センチネルリンパ節とは腫瘍からのリンパ流を最初に受けるリンパ節である．その同定は，まず色素（インジゴカルミン，インドシアニングリーンなど），またはアイソトープ（99mテクネシウム標識スズコロイド，フチン酸などのトレーサーを乳房内に投与する．トレーサーはリンパ管に浸透してリンパ節に流入し集積する．腋窩に小切開を加えて，色素法は染色されたリンパ節を視覚的に，アイソトープ法はガンマ線を放射するリンパ節をガンマプローブによって同定する（図1，2）．また，色素は重篤な自己免疫反応を呈することがあるので，色素法の際はアナフィラキシーショックへの備えが必要である．1%未満，また，色素法は習熟を要する手技

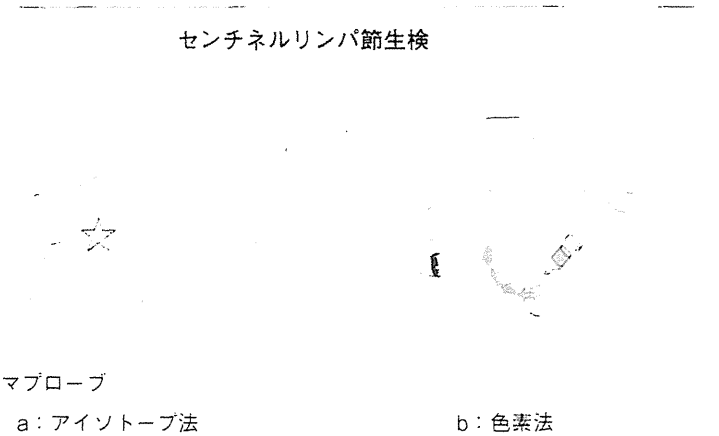

図1　色素法とアイソトープ法の原理

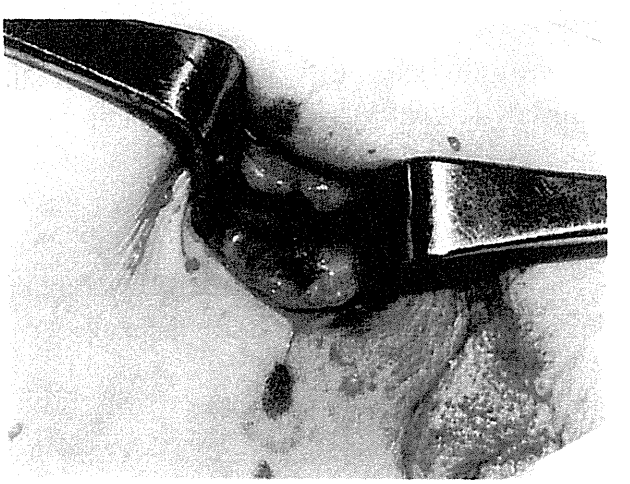

図2　インジゴカルミンで染色されたセンチネルリンパ節

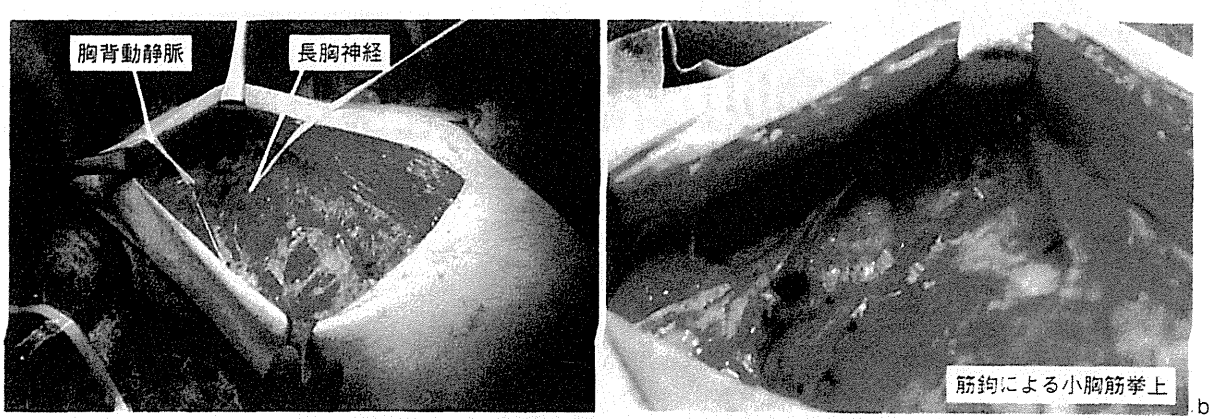

図3 レベルⅠ (a) とレベルⅡ (b) のリンパ節郭清

なので，少なくとも20例の腋窩リンパ節郭清を伴うセンチネルリンパ節生検を行うべきである．

これらの方法を併用することでセンチネルリンパ節の同定率は99%前後になるが，腋窩への生理的なリンパ流が複数存在することから，転移陽性のセンチネルリンパ節を見逃す可能性がある．また，リンパ管侵襲の著しい腫瘍では腫瘍細胞にリンパ節がほぼ占居されて，色素あるいはアイソトープにても同定できない場合がある．トレーサーを集積しないリンパ節を誤って触れる場合は，センチネルリンパ節生検の偽陰性を防ぐためにそのリンパ節を生検すべきである．

センチネルリンパ節の病理診断

センチネルリンパ節生検は，センチネルリンパ節の同定と診断からなる．センチネルリンパ節の病理診断には，リンパ節を数mm間隔に多切片のスライドを作成して検索することが望ましい．HE染色診断が基本であるが，数10 μm以下の腫瘍細胞集塊を同定するために免疫組織染色の併用も有効である．一方，凍結切片標本に基づく迅速病理診断はその診断精度に限界があることから，サイトケラチンなどの分子マーカーの増幅を指標としたRTPCR（reverse-transcriptase polymerase chain reaction）またはOSNA（one-step nuclear acid amplification）による自動診断法が実地医療に導入されつつある．

腋窩リンパ節郭清

郭清手技は手術書を参考にされたい．郭清範囲は腋窩静脈下方で小胸筋外側のレベルⅠと小胸筋下のレベルⅡが標準的である（図3）．術中，触診で上位のレベルⅢに転移を疑う場合は郭清する一方，化学療法によってN+症例の3割でリンパ節転移の陰性化が報告された．実地医療として，化学療法後に主病巣ならびに腋窩リンパ節が画像上完全腫瘍消失と診断されれば，レベルⅠリンパ節の郭清あるいは部分サンプリングも選択肢となり得る．ただし，化学療法後のセンチネルリンパ節生検に基づく郭清の個別化は，臨床研究としての説明と同意のうえに行うべきである．

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乳癌

Utility of frozen section diagnosis of surgical margin and sentinel lymph nodes for operable breast cancer patients

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【ポイント】

◆ 乳房温存手術は，整容性を考慮して画像診断による適切な切除範囲を決めることが重要である．

◆ 乳腺の切除断端における術中病理診断は，画像診断において乳管内に進展する方向を中心に検索する．

◆ センチネルリンパ節の術中病理診断は2 mm 間隔での検索が望ましいが，少なくとも数割面において転移の検索を行うべきである．

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はじめに

乳癌は集学的治療の時代にあり，手術は主に局所コントロールの目的で行われている．1980年代に導入された乳房部分切除は，放射線治療を併用した乳房温存療法として行われている[1]．現在は，画像診断によって乳管内進展を予測して，適切な範囲の乳腺を部分切除している．一方，従来見逃されていた乳管内進展巣が描出されるようになり，広範囲の乳房部分切除が必要な場合が増えている．また，乳房温存療法はその整容性が重視される時代にある．そこで，部分切除に伴う乳房の変形が予想される場合には，あえて乳房は温存せず，乳頭乳輪温存あるいは合併切除を伴う乳腺全切除を行い，筋皮弁あるいはtissue expanderなどの人工物による乳房再建を行う場合も増えている．いずれにせよ，乳房部分切除における術中病理診断は，現在も可及的に切除断端を陰性にすべく行われている．

センチネルリンパ節生検は，癌の転移を見張るリンパ節を検索してリンパ節郭清の有無を決定するリンパ節転移診断法である．しかし，微小なリンパ節転移を術中に病理診断することが困難な場合もある．

本稿では，乳腺の切除断端とセンチネルリンパ節に関する術中病理診断について述べる．

乳管内進展と温存療法後の予後

Hollandら[2]は，乳癌の主病巣からどこまで腫瘍縁を越えて乳管内を癌が進展しているか検討した．その結果，主病巣の乳管内進展の有無によって，主病巣から2 cm離れた範囲で33%と2%の症例で乳管内に癌を認めた（**図1**）．以上から，画像診断上，限局した腫瘍でも2 cmの範囲を部分切除した場合に断端が陽性になる可能性がある．Komoikeら[3]は，3 cm以下の乳癌1,901例を対象とした乳房温存療法に関する多施設共同研究について報告した．その結果，10年生存率と健存率は84%と78%であった（観察期間中央値は107か月）．同側乳房内の10年累積再発率は乳房照射群で8.5%，乳房非照射群で17.2%であった．同側乳房内再発に関する危険因子は多変量解析の結果，若年，断端陽性と乳房非照射であった．また，同側乳房内再発群は非再発群に比べて有意に遠隔転移再発を認めた．EBCTCG（Early Breast Cancer Trialists' Collaborative Group）の早期乳癌における乳房切除範囲と放射線治療に関するメタアナリシス[4]では，乳房照射の有無による15年生存率について，リンパ節転移陰性群6,097例で5%，リンパ節陽性群1,214例で7%の予後の改善が認められた．以上から，乳房温存療法では最終的な乳腺の切除断端の陰性化が望ましいが，切除断端の乳

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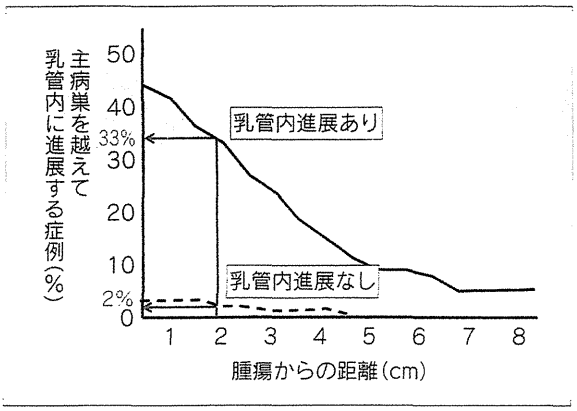

図1　腫瘍内の乳管内進展の有無と腫瘍を越えて存在する乳管内進展の範囲（文献2より引用して改変）

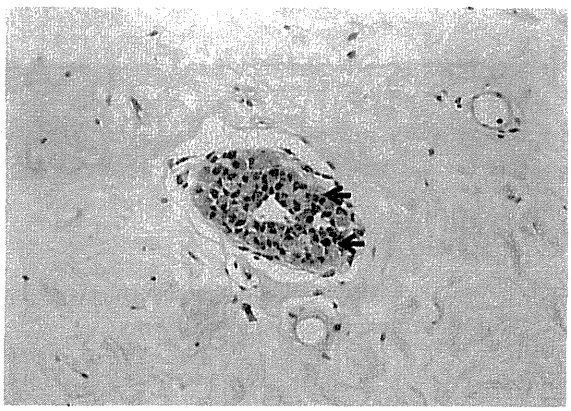

図2　切除断端に露出した乳管の迅速病理標本（×200）
乳管上皮細胞の下へ進展する小葉癌細胞（矢印）.

管内進展の有無にかかわらず乳房照射が必要である.

乳房部分切除における術中病理診断

主病巣からの乳管内進展巣は乳頭方向に進展することが多い．しかし，MRI画像などから水平方向あるいは垂直方向に進展する場合も稀ではない．筆者は乳頭方向の切除断端を術中病理診断に供しているが，以前所属していた国立がんセンター(現・国立がん研究センター)東病院の乳腺外科での乳房部分切除における断端陰性率は83%であった(2004年 日本乳癌学会総会抄録集O-208)．乳頭方向の切除断端をほぼ陰性化しても，側方，頭側(尾側)，あるいは深部側の断端の陰性化を術中病理診断ですべて陰性化することは困難である.

切除断端を術中にどう調べるか？

温存乳房の整容性を考慮して，かつ少なくとも切除断端ぎりぎりで乳管内進展巣の露出を防ぐということであれば，切除標本の側面ならびに胸筋側をすべて術中に調べるということになる．しかし，実地臨床では全く不可能である．また，凍結切片標本による術中病理診断の敏感度と特異度は，それぞれ65～78%と98～100%と報告されている[5]．さらに，非浸潤性乳管癌の乳房部分切除において，切除断端から腫瘍までの距離を少なくとも2mm以上離すことで同側乳房内再発を最小限に抑えられたと報告された[6]．以上から，まず画像診断による乳管内進展巣の予測から切除範囲を決定し，次に乳管内進展巣が最も近接すると考えられる乳頭側，頭側，尾側，あるいは外側の切除断端を術中病理診断に供することが実際的である．しかし，切除断端に浸潤癌が露出する場合や，多発する乳管内進展巣が認められる場合は，追加部分切除あるいは全切除すべきである．特に，画像診断で乳管内進展が広範に存在する場合は，術中追加切除あるいは術中または2期的乳腺全切除の可能性について術前に説明すべきである．一方，小葉癌の術中病理診断では偽陰性になる場合もあるので，術前の組織診断で小葉癌の場合は，術者が病理医にその情報を事前に伝えて慎重に術中病理診断を行うべきである（**図2**）.

センチネルリンパ節の術中病理診断

2010年4月より乳癌のセンチネルリンパ節生検は保険収載された．センチネルリンパ節に転移がなければリンパ節郭清は不必要である．そこで，センチネルリンパ節を術中に詳細に病理診断することは重要である．Veronesiら[7]は，Ⅰ期乳癌を対象としたセンチネルリンパ節生検の第Ⅲ相臨床試験において詳細な術中病理診断を行った．5mm以上のリンパ節をその長軸方向で半割し，各々50 μm間隔で15組の4 μm切片（合計60切片）を作製した．さらに残ったリンパ節は100 μm間隔で切片を作製した．それぞれHE染色で診断し，診断が曖昧な場合はサイトケラチン抗体（MNF116）を用いた迅速法による免疫染色診断を行った．登録された516例中175例（34%）がセンチネルリンパ節転移陽性であった．しかし，ここまで迅速病理診断を行う施設あるいは臨床試験は稀である.

センチネルリンパ節のOSNA法による術中診断

One-step nucleic acid amplification（OSNA）法は，サイトケラチン19のmRNAの増幅測定によってリン

パ節を転移診断する方法である[8]．その結果，2 mmより大きいマクロ転移と0.2～2 mmのミクロ転移とを98%の診断精度をもって区分し診断することができた．偽陽性例はなく，短時間にリンパ節のマクロ転移を診断する方法として優れている．しかし，サイトケラチン19 mRNA発現のカットオフ値の設定から0.2 mm以下のisolated tumor cells（ITC）とミクロ転移との検出率は低かった．いずれにせよ，病理医の精度と遜色のない優れた術中のリンパ節転移診断法である．

センチネルリンパ節を術中どう調べるか？

術中病理診断には，人的資源，切片作製と染色の技術，手術症例数，診断までの時間制限，病理医の診断精度など，数多くの制約がある．実地臨床において，少なくともミクロ転移を見逃さないように可及的に2 mm間隔で割面を作製して，HE染色で診断することが望ましい．もし困難であれば，少なくとも数割面を作製して診断することが望まれる．

センチネルリンパ節転移陽性乳癌の予後

米国大学外科腫瘍グループ（ACOSOG）では，Ⅰ-ⅡA期乳癌で乳房温存療法を予定した患者を対象に，HE染色で診断されたセンチネルリンパ節転移陽性乳癌におけるリンパ節郭清の意義について，第Ⅲ相臨床試験を1999年に開始した[9]．Primary endpointは郭清の有無による生存率の差であり，1,900例の登録予定であった．しかし，症例集積の遅延と再発率が低かったため，2004年に試験は中止された．その結果，登録された郭清群445例中97例（22%）で非センチネルリンパ節に転移を認めた．しかし，驚くべきことに6年の観察期間において非郭清群446例の所属リンパ節再発はわずか4例（1%）であった．多変量解析では，腫瘍の悪性度のみが，局所あるいは所属リンパ節再発に関する有意な因子であった．非郭清群に所属リンパ節再発が少なかった原因として，9割以上の症例で補助薬物療法が行われたこと，温存乳房の照射野の一部に腋窩が含まれていた可能性が高いこと，癌の生物学的特性によって再発が顕性化していないことが挙げられた．いずれにせよ，精度の高いセンチネルリンパ節の同定を行い，そのリンパ節を詳細に検討することは重要であるが，迅速病理診断によってセンチネルリンパ節転移陽性であった場合に郭清を一期的に行うかどうかは，今後の重要な課題である．

おわりに

乳癌手術における迅速病理診断の意義について考察した．乳癌の診断と治療の体系において，迅速病理診断の意義も変化している．ただし，各施設における外科，病理，臨床検査の人的資源が有効に活用され，病理検体を提出する側と診断する側の相互信頼が質の高い病理診断に不可欠であることは変わらない．

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ラジオアイソトープ（RI）法を用いた乳癌センチネルリンパ節生検手技

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はじめに

2010年4月に乳癌を対象にセンチネルリンパ節生検が保険収載された。色素やラジオアイソトープ（RI）などのトレーサーを用いたセンチネルリンパ節生検によって，センチネルリンパ節に転移を認めなければ不必要な腋窩リンパ節郭清（腋窩郭清）が省略される時代になった．折しも，2010年米国臨床腫瘍学会では，大規模なセンチネルリンパ節生検に関する臨床試験であるNSABP B32，並びにACOSOG Z0010とZ0011の5年予後が報告された（表1）。その結果，NSABP B32では，センチネルリンパ節転移陰性［pN0（sn）］乳癌において，センチネルリンパ節生検のみと腋窩郭清との手技の違いによる予後の差は認められなかった．また，ACOSOG Z0010では，pN0（sn）乳癌は抗サイトケラチン抗体による免疫組織染色によってup-stagingされてもその予後に影響がなく，HE染色による病理組織診断の妥当性が示唆された．さらに，症例登録がはかばかしくなく中止となったACOSOG Z0011では，センチネルリンパ節に微小転移［pNmi（sn）］やマクロ転移［pN1（sn）］を認めた場合でも，腋窩郭清による予後の改善は認められなかった．腋窩郭清群とセンチネルリンパ節生検群の5年リンパ節再発率は0.6%と1.3%と報告された。センチネルリンパ節生検のみでもリンパ節再発が低かった理由として，補助薬物療法が奏効すれば非センチネルリンパ節転移の陰性化が期待できること，登録された症例において非センチネルリンパ節転移の陽性率が低い可能性があったこと，仮にリンパ節転移が遺残していても顕性化しない場合があることが考えられる．以上の結果から，センチネルリンパ節生検は早期乳癌手術における基本手技であり，センチネルリンパ節生検を理解することは乳癌専門医のみならず一般外科医

表1 センチネルリンパ節生検に関する臨床試験（2010年米国臨床腫瘍学会報告）

試験名	NSABP B32（5,611例）	ACOSOG Z0010（5,539例）	ACOSOG Z0011（891例）
pN0（sn）乳癌の5年生存率	SNB対SNB+AX 95%対96%	免疫組織染色診断 SN+対SN- 96%対95%	
pN1mi(sn)またはpN1（sn）乳癌の5年生存率		Z0010症例と比較 SN+対SN- 93%対96%	SNB対SNB+AX 95%対96%（リンパ節再発：1.3%対0.6%）

ACOSOG；American College of Surgeons Oncology Group，AX；腋窩リンパ節郭清，NSABP；National Surgical Adjuvant Breast and Bowel Project，SNB；センチネルリンパ節生検，SN+；センチネルリンパ節転移陽性，SN-；センチネルリンパ節転移陰性

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key words
乳癌，センチネルリンパ節生検，ラジオアイソトープ

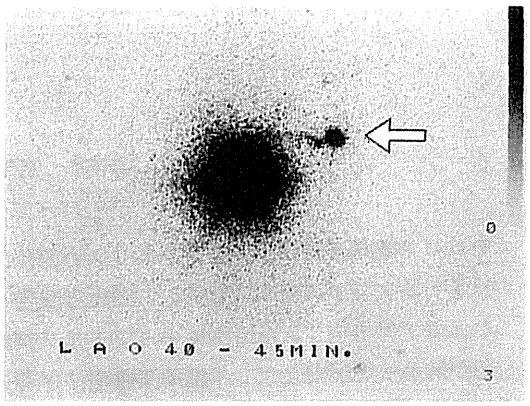

図1　RIを集積したhot spotとしてシンチグラムに描出されたセンチネルリンパ節（矢印）

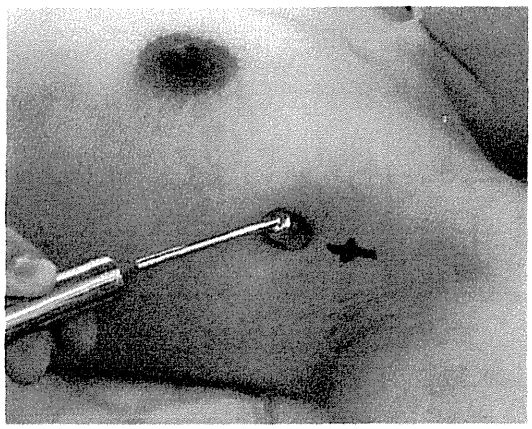

図2　ガンマプローブによるセンチネルリンパ節の探索
×印はシンチカメラ下でのhot spotの位置。

においても重要である。

Ⅰ．RI法の特徴

センチネルリンパ節とは，腫瘍からのリンパ流を最初に受けるリンパ節と定義される。RI法はKragらが1993年に乳癌における最初のセンチネルリンパ節生検法として報告した[1]。RI法では，半減期が約6時間であるテクネシウム99mで標識されたトレーサーを乳房内に投与する。アイソトープを集積したリンパ節は，シンチカメラ下でhot spotとして描出される（**図1**）。このリンパ節から放射されるガンマ線を高感度なガンマ線検出器（ガンマプローブ）で同定し生検する方法がRI法である（**図2**）　センチネルリンパ節を同定するトレーサーとして，RIや色素に加えて，CT造影剤[2]を用いた方法や色素からの蛍光波長を近赤外線カメラで同定する方法[3]も開発されている。また，RI法の新たなマッピング技術としてSPECTとの融合による同定法も考案されている[4]。

RI法の長所として，①センチネルリンパ節がガンマプローブによって容易に同定されること，②異なる領域に存在する複数個のセンチネルリンパ節の同定にすぐれていること，③皮膚より深部にセンチネルリンパ節が存在しても手技に支障がないことがあげられる[5]　色素法や蛍光波長を同定する方法では，センチネルリンパ節の解剖学的位置によってリンパ節を可視的にあるいは画像的にとらえるのが困難な場合がある　一方，RI法の短所として，①RI管理区域を要する施設でしか行えないこと，②RIならびにシンチグラフィ検査が高価であること，③ほかのRI検査に比べて少ないがRI使用に伴う患者ならびに医療従事者の被曝，があげられる。

Ⅱ．RI法の実際

RIは，2009年乳癌のリンパ管シンチグラフィにおける医薬品として追加承認されたテクネシウム99m標識フチン酸または同標識スズコロイドを用いる　術前日あるいは当日に数10 MBqのRIを腫瘍周囲，腫瘍直上，または乳輪近傍に投与する。投与の深さは腫瘍周囲，皮下，皮内とさまざまであるが，投与するRI量もセンチネルリンパ節に集積するRI量に影響する。なお，シンチカメラ下でhot spotを皮膚にマーキングしておくと術中のセンチネルリンパ節生検は容易である（**図1，2**）　センチネルリンパ節からのガンマ線の放射活性は距離の二乗に反比例して減衰する。まず，ガンマプローブの向きを変えてもっともガンマ線を検出する方向を見出し，つぎにその方向へガンマプローブを皮膚から深部に向けて押し付けてリンパ節の位置を探索する。皮膚に加えた小切開創から，滅菌したビニール袋で覆ったガンマプローブを押し当てると，皮膚からの探索よ

りはるかに高い放射活性が検出される（**図3**）．また，生検したセンチネルリンパ節をex vivoでその放射活性をカウントすると，体内でのカウントよりさらに高い値が測定される．

Ⅲ．RI法のコツ

RIを集積したセンチネルリンパ節はガンマプローブによって敏感に容易に同定されるが，RI投与部位からのガンマ線がhot spotに重なることによってガンマプローブでの検出が困難な場合がある（shine-through現象）。この場合は，シンチカメラで正面像に加えて斜位像を撮影すると隠れていたhot spotが描出されることがある（**図4**）。また，色素法やほかの方法の併用もセンチネルリンパ節の見逃しを防ぐうえで有効である。

RIの投与時期は手術前日でも当日でもhot spotの描出は明瞭である（**図5**）。RI投与量を増やしたり手術直前にRIを投与することで，高い放射活性を有するセンチネルリンパ節が同定されるが，必要以上の被曝を避けるべくRI投与量を少なくする努力も必要である。日本核医学会からセンチネルリンパ節の核医学的検出法ガイドラインが出されている。そのなかで，74MBqが残存する患者に50 cmの距離で，1時間作業した場合の術者の被曝線量は約6 μSvとされている[6]。

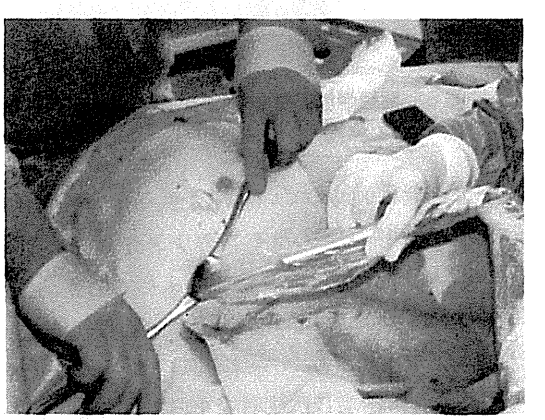

図3　術中のガンマプローブの操作

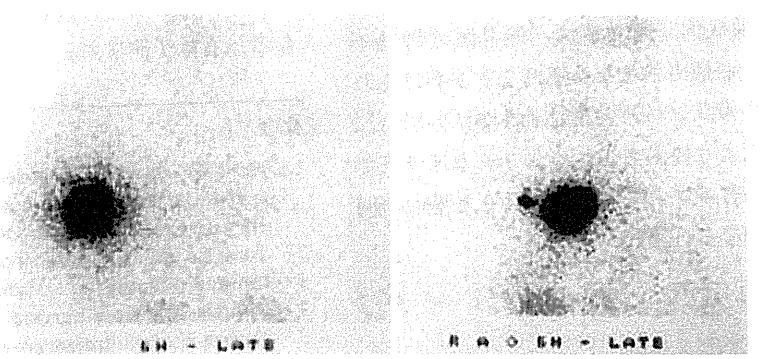

図4　Shine-through現象とシンチカメラでの斜位像の有用性
a）正面像。b）斜位像。

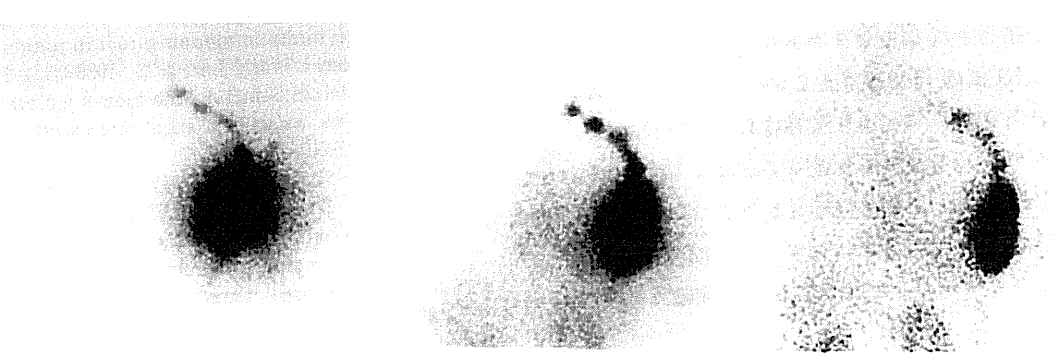

図5　RI投与後のシンチグラムでのhot spotの推移
a）5分後，b）3時間後，c）24時間後。

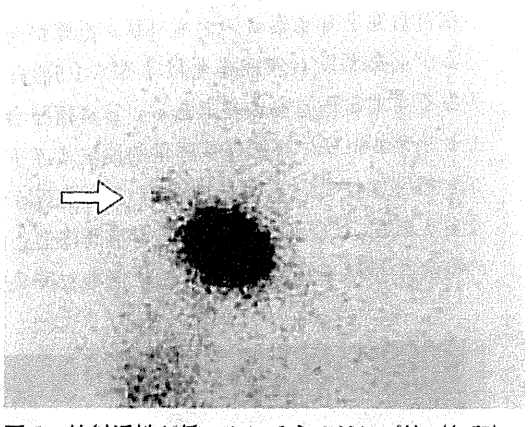

図6　放射活性が低いセンチネルリンパ節（矢印）

表2　センチネルリンパ節転移陽性乳癌に関する臨床試験

試験名	対象	目的
EORTC 10981-22023	pN1(sn)乳癌	腋窩郭清と腋窩照射の比較
IBCSG 23-1	pN1mi(sn)乳癌	腋窩郭清と非郭清の比較
ACOSOG Z1071	T1-4N1-2乳癌	化学療法後のSNBの妥当性

ACOSOG：American College of Surgeons Oncology Group，EORTC：European Organization for Research and Treatment of Cancer，IBCSG：International Breast Cancer Study Group，SNB：センチネルリンパ節生検

筆者が以前勤めていた国立がんセンター東病院での手術中の被曝のモニタリングでは，術前日に40 MBqを乳房に投与した6人の患者から10 cmの距離で測定した被曝線量の平均値は9 μSvであった（未報告）。いずれにせよ，RI法の施行に当たっては，普段放射線を取り扱わない医療従事者の理解と協力が不可欠である

センチネルリンパ節生検が失敗する症例の要因として，高齢症例，肥満症例，外科医の習熟不足，hot spotが描出されない症例などがあげられる　センチネルリンパ節の放射活性が低い場合には，前述したようにあらかじめシンチカメラ下でhot spotを皮膚にマーキングしておくと術中の同定の手引きとなる（図6）

おわりに

日本人女性の乳癌罹患者数は4万人を越え，センチネルリンパ節生検の対象となる患者は2万人と推測される　センチネルリンパ節の同定が容易なRI法の普及は望ましいが，その使用には条件がありその同定にも限界はある　質の高いセンチネルリンパ節生検を保障するには，精度の高いセンチネルリンパ節の同定と精度の高い病理診断が必須である　RI法は精度の高い同定法であるが，センチネルリンパ節をどこまで詳細に転移検索すべきか，どこまで微小なリンパ節転移が予後に影響を与えるかという課題に関する第Ⅲ相臨床試験が進行中である（表2）　より簡便により正確に微小なリンパ節転移を検出するための分子マーカーを用いた診断法も開発された[7]　いずれにせよ，10年あるいは20年先に生体内でミクロレベルの癌細胞の集塊を動的に診断できるようになれば，センチネルリンパ節生検自体の役割は終わるものと筆者は予測する

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ORIGINAL ARTICLE—ALIMENTARY TRACT

Development and validation of a modified fecal incontinence quality of life scale for Japanese patients after intersphincteric resection for very low rectal cancer

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Abstract

Purpose Fecal incontinence is a frequently observed symptom after lower rectal surgery with sphincter manipulation. The aim of this study was to evaluate a proposed modification to the fecal incontinence quality of life (FIQL) scale for the assessment of the quality of life among patients with very low rectal cancer who have undergone intersphincteric resection.

Methods A single 14-item composite scale was prepared that was derived from items in the "Lifestyle" and "Coping" subscales of the original FIQL. The scale was tested with a convenience sample of 152 postoperative patients. In addition to classic psychometric evaluation, newer statistical techniques, such as a multiple correspondence analysis and partial credit model, were performed to evaluate the item response patterns.

Results The proposed scale exhibited an item-rest correlation of 0.66–0.84 and a Cronbach's alpha of 0.96, and was correlated with concurrently measured Social Functioning subscale of the Medical Outcomes Study Short Form 36 (−0.70), physical role limitation (−0.61), and Wexner continence grading scale (−0.61). Multiple correspondence analysis supported a uni-dimensional construct, and the partial credit model showed a varying yet overlapping range of item response thresholds across items. Several items, such as "Locating bathroom whenever

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going out", reflected more a serious condition than items such as "Avoiding eating-out." Weighted item scores based on estimated thresholds provided results comparable with those based on non-weighted scores.

Conclusions The proposed modification to the FIQL scale exhibited high internal consistency and satisfactory concurrent and convergence validity. The modified scale is practical to administer and is sensitive to a range of functional problems associated with fecal incontinence among patients who have undergone intersphincteric resection.

Keywords Fecal incontinence · FIQL · Intersphincteric resection · Very low rectal cancer

Introduction

Fecal incontinence following lower rectal cancer resection proves to be a challenging postoperative condition for patients because of various psychosocial impacts that it causes to their daily life. Once an oncologically safe resection margin is secured, controlling postoperative fecal incontinence is a major factor to be considered during the choice of operative strategy. Such concerns have led to a recent debate on the advantages of sphincter-preserving resection over abdominoperineal resection [1]. The debate has been extended to the question of whether intersphincteric resection with transanal coloanal anastomosis for very low rectal cancer, a newer operation, is beneficial for the patient's quality of life [2, 3], although the results of earlier studies are mainly based on the surgeon's objective evaluation of the patient's postoperative function.

The recent movement towards patient-centered medicine, however, would require the evaluation of operative consequences on the patient's life from his/her perspective [4]. The severity of fecal incontinence is often defined by observable objective findings, such as frequency of leakage, whereas the functional impact of fecal incontinence is measurable only through a patient's subjective perception of the impact of incontinence events in daily activities. These two aspects of fecal incontinence may overlap with each other, but they are conceptually distinctive [5, 6].

The most popular scale used for the measurement of patient's perception of fecal incontinence is the fecal incontinence quality of life (FIQL) scale [7]. The scale has already been applied for the evaluation of lower rectal resection strategies and other surgical outcomes [8]. The original FIQL scale is composed of 29 items with four subscales: "Lifestyle" (10 items), "Coping/Behavior" (9 items), "Depression/Self-Perception" (7 items), and "Embarrassment" (3 items). Each subscale has been shown to have a sufficient level of reliability. The scale has already been translated into French [9], Portuguese [10], Italian [11], and Spanish [12].

The FIQL scale is virtually the only available validated scale for measuring the perceived impact of incontinence, and there is some scope for its further improvement. Firstly, the psychometric construction of the scale needs further sophistication. For example, the response sets in the scale are not uniform: items in Q2 consist of questions regarding the frequency of listed events (e.g., "none of the time", or "most of the time"), whereas those in Q3 consist of an agree/disagree type of response. Despite this non-uniformity, the scores are equally counted without sufficient psychometric justification. In fact, in the Spanish version, all of the response sets have been replaced with a frequency response set [12]. Secondly, some items need theoretical reconstruction for construct and convergence validity. The "Coping/behavior" subscale includes items on psychological coping (e.g., "I feel I have no control over my bowels") and behavioral coping (e.g., "Prevent bowel accidents by staying very near a bathroom"). The former may overlap with the "depression" subscale, while the latter may overlap with the "Lifestyle" subscale (e.g., "Plan my schedule around my bowel pattern"). A previous translation study has also indicated that some items in this subscale fail to demonstrate statistical convergence with the remaining items [9]. Thirdly, a shorter version is preferred to facilitate practical implementation of the scale [6, 9]. In this scale, several items appeared to overlap in terms of their contents. Finally, the degree of significance of the events described in scale items may vary, although the scale applies uniform scoring to scale responses and items. As Rockwood, the original author of the scale, has mentioned in his review [6], a proper weighting scheme deserves more research attention.

Given this background, the aim of the study reported here was to evaluate a proposed modification of the FIQL scale for the assessment of the quality of life among patients who have undergone intersphincteric resection. We prepared a single, shorter composite scale that was derived from items theoretically selected from the FIQL subscales. Using newer statistical techniques, such as multiple correspondence analysis and the partial credit model, we evaluated the modified scale in terms of its scale construct and item-specific threshold of item responses. On the basis of the results, we then discussed whether the proposed modification could achieve an improved measurement of the quality of life among incontinent patients.

Methods

This study was designed and conducted by the intersphincteric resection operation for the Very Low Rectal

Cancer Study Group of Japanese Society for Cancer of the Colon and Rectum, as a part of clinical observational studies on the prognosis of patients who have undergone different types of intersphincteric resection operation for very low rectal cancer.

Scale item selection

The FIQL scale was originally developed by Rockwood et al. [7]. It has been made available for public use without declared copyright thanks to the generosity of the original authors. Of the four subscales of the FIQL, we focused on the "Lifestyle" and "Coping/Behavior" subscales. We did not include the "Depression" subscale because a number of validated generic scales are already available for the measurement of depression. Generic scales are more suitable for a comparison between incontinent patients and those with other conditions.

We also omitted three items of the "Embarrassment" subscale because they do not seem to reflect this emotion precisely; this doubt was also expressed in a previous study [4]. The sentiment of embarrassment would depend on cultural norms of "embarrassment" and "shame", which are known to be quite diverse across cultures, [13, 14], and it was well beyond the scope of this study to develop items universally applicable to different cultural backgrounds on this theme.

We omitted Q2h ("I avoid traveling") among the ten items of the "Lifestyle" subscale because it was similar to Q3l ("I avoid traveling by plane or train"), and the latter is more specific to conditions that require long periods of sitting. Q2d ("Difficult to do things like going to a movie or church") was revised to "Going for a movie or to the theater" because of cultural concerns for non-Christian subjects. Among the nine items of the "Coping/Behavior" scale, Q2k ("Can't hold my bowel movement long enough to get to the bathroom") was omitted because it appears to be more of a function rather than a coping response. Q2m ("Prevent bowel accidents by staying very near a bathroom") was omitted because it was similar to Q2f ("Whenever I am away from home, I try to stay near a restroom as much as possible."). Q2j ("I feel I have no control over my bowels") is related more to a sense of control, which we believed might deserve independent measurement by measuring self-efficacy and the locus of control. Q3c ("I worry about bowel accidents") was similar to Q3j ("The possibility of bowel accidents is always on my mind") and was not included. Finally, although Q3h ("I have sex less often than I would like to") is very important, we omitted this item due to cultural considerations (for example, Japanese consider questions on one's sex life to be an extreme invasion of personal privacy). A previous study on bowel diseases experienced a lower response rate to an item related to the sexual life of the patient [15]. We added the following item: "Due to accidental bowel leakage, I have difficulty in getting to sleep, or I wake up during the night." Ultimately, a 14-item scale was developed for further psychometric assessment. Responses for all of the constituent items were sought in a common response set by asking participants to select one of four responses, namely, (1) None of the time, (2) A little of the time, (3) Some of the time, and (4) Most of the time; this approach follows that applied in the Spanish version.

Study design and patients

We conducted a cross-sectional survey with a convenience sample of 152 consecutive postoperative patients who had undergone intersphincteric resection for very low rectal cancer with trans-anal coloanal anastomosis during the period between January 2001 and April 2005; these were the cases of Curative A. All of the patients who met the above criteria were consecutively asked to participate in the study and were ultimately included in the study. The survey was conducted between March and October 2007.

A self-administered questionnaire that included the modified FIQL scale was distributed to the subjects to collect subjective data. The questionnaire comprised the modified FIQL scale, the Medical Outcomes Study Short Form 36 (MOS SF36) [16–18], the Hospital Anxiety and Depression Scales (HADS) [19, 20], and the Wexner Continence Grading Scale (WCG) [21].

Medical records were reviewed with a standardized format for the date and types of surgical operation, types of stoma (ileostomy vs. colostomy) and the date of stoma closure, the types of pouch formation, and radiation therapy. The operation types were categorized into external sphincter resection (ESR) and internal sphincter resection (ISR); ISR cases were further divided into partial, subtotal, and total types on the basis of classification used in the review article by Saito et al. [3].

Written material was disseminated to explain the purpose of the study. Participating patients who had consented were asked to return the completed questionnaire by mail. The study protocol was approved by the Internal Review Board at the institute that the second, third, and last authors were affiliated with (Toho University School of Medicine Ethics Review Board; approval registered as no. 17–41).

Statistical analysis

Descriptive statistics were obtained for each item in terms of its response rate and categorical distribution to check its feasibility and ceiling/flooring effects. The item-rest correlation was calculated as a classic index of item

convergence to the scale, and Cronbach's alpha was calculated as an index of internal consistency. The composite score was subsequently obtained by calculating the mean of the 14 items by following the original scoring algorithm. The correlations between the calculated score and those of the SF36 subscales, HADS subscales, and WCG were tested for the purpose of examining concurrent validity.

Two statistical techniques were used to evaluate the item response pattern. First, a multiple correspondence analysis was performed to analyze the relative positions of item responses. The multiple correspondence analysis is a generalization of principal component analysis to categorical variables and is a technique to explore relationships within a set of categorical variables [22]. By displaying "relative positions" of categorical responses in a property space in two dimensions, the technique allows the researcher to visually diagnose uni-dimensionality and the distribution of item response categories.

Second, the partial credit model with one parameter was conducted to obtain item-specific thresholds [23.] Our choice of a one-parameter model rather than a two-parameter model was based on the suspicion that our sample size may be too small to obtain robust estimation with two-parameter model. Parameter estimation was obtained by using the generalized linear latent and mixed models (GLLAMMs) with multiple logit link function [24].

All statistical analyses were conducted using Stata Special Edition version 10 (Stata Corp, College Station, TX). The GLLAMM model was run on a free-share program called "gllamm," which is available at http://www.gllamm.org.

Results

Patient's characteristics

Table 1 shows the characteristics of the patients included in our study. The mean age of the patient cohort was 58 years, and there was a predominance of males (71.7%). Approximately 90% of the patients underwent an operation involving an internal sphincter resection (ISR). The median postoperative duration at the time of the survey was 36 months (range 6.2–86.3). With the exception of three patients, all patients had a temporary stoma and, at the time of the survey, the median time since stoma closure was 26 months (range 0.7–82.0 months).

Psychometric performance of the modified scale

Table 2 shows the response rates, distribution, and item-rest correlation of each item. With the exception of items 3 ("Avoid staying overnight away home") and 4 ("Difficult to get out and do things like going to a movie or theater"), non-response was <5%. For items 4, 5 ("Cut down how much I eat before going out"), and 11 ("Avoid going out to eat"), the responses of >40% of the patients belonged to the lowest category ("None of the time"). The item-rest correlation ranged from 0.66 to 0.84 and always exceeded the correlation of the item with other concurrently measured scales (SF36 subscales, HADS subscales, and WCG scores) (data not shown in the table). The Cronbach's alpha for this 14-item scale was 0.955.

Table 3 shows the Pearson's correlation of the modified scale with the subscales of MOS SF36, HADS, and WCG. The scale had the highest magnitude of correlation with the Social Functioning subscale of SF36 (−0.70), followed by the Depression subscale of HADS (0.65), Physical Role Limitation subscale of SF36 (−0.61), and WCG scale (−0.61). The magnitude of correlation with all the scales exceeded 0.50 except for the General Health Perception subscale of SF36.

Table 1 Baseline characteristics of the patient cohort

Baseline characteristics	Values	Note
Patient characteristics (n = 152)		
Age, years (mean ± SD) [min, max]	58.4 ± 11.1 [27, 80]	
Males, n (%)	109 (71.7)	
Married, n (%)	109 (76.2)	9 Missing
Work status, n (%)		11 Missing
Full-time	46 (32.6)	
Part-time	11 (7.8)	
On leave/unemployed	36 (25.5)	
Homemaker	22 (15.6)	
Other	26 (18.4)	
Operation type, n (%)		
ESR	15 (9.9)	
ISR partial	62 (40.8)	
ISR subtotal	38 (25.0)	
ISR total	37 (24.3)	
Months since operation, median [min, max]		10 Missing
ESR	38.5 [10.2, 70.7]	
ISR partial	36.8 [6.7, 86.3]	
ISR subtotal	34.0 [8.4, 84.6]	
ISR total	39.5 [6.2, 81.3]	
Months since stoma closure, median [min, max]		11 Missing
ESR	31.7 [3.5, 58.4]	
ISR partial	26.4 [0.7, 82.0]	
ISR subtotal	24.1 [1.8, 78.9]	
ISR total	26.5 [2.6, 69.4]	
Postoperative radiation, n (%)	26 (17.1)	

ESR external sphincter resection, *ISR* internal sphincter resection, *SD* standard deviation

Table 2 Response rate and distribution of each item

Item	Due to accidental bowel leakage	Missing (%)	Lowest response (%)	Highest response (%)	Item-rest correlation	Original FIQL item [7]	Original FIQL subscale [7]
1	I am afraid to go out	3.3	32.9	10.5	0.81	Q2a	Lifestyle
2	I avoid visiting friends	3.3	40.1	9.9	0.82	Q2b	Lifestyle
3	I avoid staying overnight away from home	5.3	40.1	21.1	0.76	Q2c	Lifestyle
4	It is difficult for me to get out and do things like going to a movie or theater	5.9	46.1	10.5	0.80	Q2d modified text	Lifestyle
5	I cut down on how much I eat before I go out	4.0	42.8	11.8	0.64	Q2e	Lifestyle
6	Whenever I am away from home, I try to stay near a restroom as much as possible	4.6	28.3	18.4	0.79	Q2f	Coping/behavior
7	It is important to plan my schedule (daily activities) around my bowel pattern	4.0	21.1	28.3	0.75	Q2g	Lifestyle
8	I can not do many of things I want to do	4.0	28.3	7.9	0.84	Q3b with modified response	Lifestyle
9	I avoid traveling by plane or train	4.6	37.5	20.4	0.77	Q3l with modified response	Lifestyle
10	I worry about not being able to get to the toilet in time	4.0	17.8	20.4	0.81	Q2i	Coping/behavior
11	I avoid going out to eat	4.0	52.0	10.5	0.77	Q3m with modified response	Lifestyle
12	I cannot get to sleep, or wake up during the night	3.3	40.1	4.0	0.66	Newly added	
13	The possibility of bowel accidents is always on my mind	3.3	26.3	19.7	0.77	Q3j with modified response	Coping/behavior
14	Whenever I go someplace new, I specifically locate where the bathrooms are	4.0	18.4	32.9	0.73	Q3n with modified response	Coping/behavior

Response categories are: 1, None of the time; 2, A little of the time; 3, Some of the time; 4, Most of the time

FIQL fecal incontinence quality of life scale

Figure 1 shows the results of the multiple correspondence analysis. The first (horizontal) axis explains 0.780 of inertia, and the second axis (vertical) explains 0.154. Thus, the first dimension explains a dominant share of the response distribution. As the figure shows, the item responses were distributed in a U shape, suggesting that they were composed of a uni-dimensional construct. Each of the four response levels of frequency clearly formed a cluster with a minimum overlap, suggesting that the item responses were discriminating each other.

Table 4 presents the item-specific thresholds of the ordinary response of each item as estimated by the partial credit model. The first threshold showed a wide variety across items; Item 11 ("Avoid eating out") and 12 ("Difficult to get to sleep") showed the lowest first threshold, while Item 14 ("Locate bathroom") and Item 7 ("Plan schedule around bowel pattern") showed the highest first threshold. Second and third thresholds were distributed relatively close across items. Figure 2 showed the item characteristic curves (ICCs) of two selected items, Item 11 and Item 14. The ICC of Item 14 showed that four responses of the item were distinctively distributed, while that of Item 11 showed that the third category ("Some of the time") failed to demonstrate a discriminative response. Based on the estimated thresholds, we assigned a different score for each item response and recalculated the score. The Pearson's correlation between this recalculated score and original one was 0.986.

Discussion

Our proposed modification of the FIQL scale demonstrates a fairly high level of item convergence, internal consistency, and concurrent validity with existing measures. The level of internal consistency exceeded the values reported for the original English scale. The modified scale also clearly demonstrates a range of item response in a simple uni-dimensional construct, which strongly supports its use as a single composite scale.

Table 3 Concurrent validity of modified FIQL with MOS SF36 and HADS

	Physical role	General health	Vitality	Social functioning	Emotional role	Mental health
Medical Outcomes Study Short Form 36 (SF36)						
Modified FIQL	−0.61	−0.32	−0.53	−0.70	−0.58	−0.53
	Anxiety	Depression				
Hospital Anxiety and Depression Scales (HADS)						
Modified FIQL	0.56	0.65				
	WCG					
Wexner Continence Grading Scale (WCG)						
Modified FIQL	0.61					

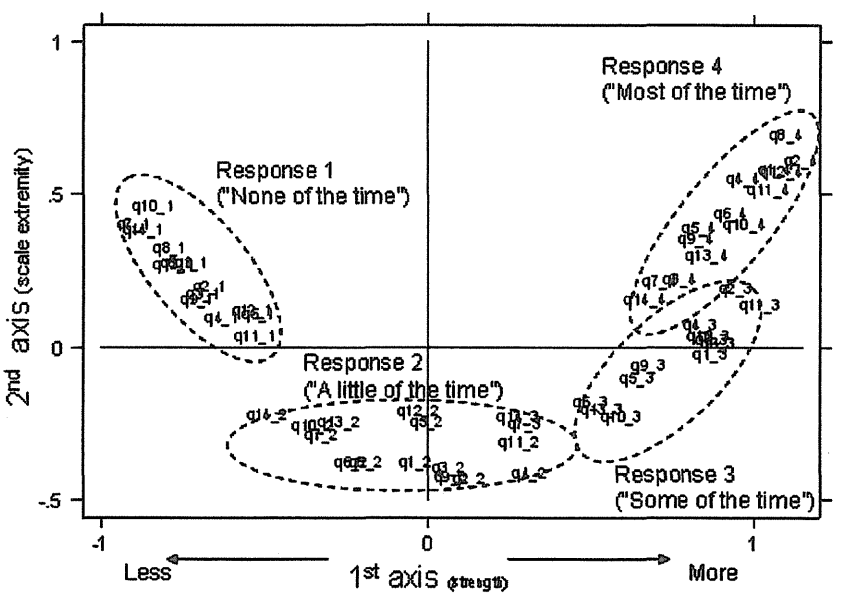

Fig. 1 Results of the multiple correspondence analysis. Each *data point* consists of the item number and the level of response. For example, *q8_4* indicates response 4 ("Most of the time") of item 8

As Rockwood mentioned in his review, "quality-of-life scales assess variables that are not directly observable and are highly subjective" [6]. As he also mentioned, generic and condition/treatment-specific scales are often available as options, and since their roles are complementary to each other, concurrent administration of both is often recommended. The original FIQL and modification proposed herein both aim at measuring the impact of fecal incontinence on socio-psychological dimensions of life as perceived by the patient. Although the event that each item describes provides a potentially useful "window" for viewing subjective experiences related to the disability, our results suggest that these events would affect the patients' life with substantially varying thresholds.

Items related to worries about the availability of the bathroom (e.g., Items 10 and 14) and bowel habits (e.g., item 7) showed the highest first threshold. This result suggests that concerns with bathroom availability and bowel habits mirror the higher range of negative impact on the quality of life due to incontinence among those post-operative patients. To the contrary, restrictions with regard to sleep (Item 12) and going out to public places (e.g., Items 4 and 11) showed the lowest first threshold, suggesting that these items are more sensitive to milder disturbances due to incontinence on patient's quality of life.

Although the item thresholds vary across items, as mentioned above, the results of the multiple correspondence analysis shown in Fig. 1 suggest that response levels are discretely clustered. Thus, the original scoring algorithm without re-scoring was expected to provide a similar robust score as the re-scoring based on the estimated thresholds. This similarity was confirmed as we found an

Table 4 Estimate of item location parameters

Item number	Threshold 1 (standard error)	Threshold 2 (standard error)	Threshold 3 (standard error)
1	−3.515 (0.604)	−0.099 (0.212)	1.015 (0.255)
2	−3.077 (0.478)	0.186 (0.212)	1.057 (0.268)
3	−2.610 (0.390)	0.396 (0.219)	0.832 (0.269)
4	−3.732 (0.599)	0.626 (0.221)	0.734 (0.274)
5	−3.369 (0.526)	0.490 (0.224)	0.486 (0.260)
6	−2.547 (0.419)	−0.023 (0.230)	0.263 (0.238)
7	−1.959 (0.373)	−0.359 (0.240)	0.135 (0.229)
8	−3.371 (0.607)	−0.346 (0.222)	0.583 (0.233)
9	−2.230 (0.344)	0.358 (0.221)	0.836 (0.269)
10	−2.048 (0.411)	−0.919 (0.232)	1.047 (0.236)
11	−4.239 (0.724)	0.905 (0.222)	1.021 (0.304)
12	−4.028 (0.727)	0.211 (0.216)	0.733 (0.255)
13	−2.918 (0.483)	−0.036 (0.228)	0.280 (0.237)
14	−1.748 (0.336)	−0.183 (0.235)	0.293 (0.237)

Threshold 1: from "None of the time" to "A little of the time"; Threshold 2: from "A little of the time" to "Some of the time"; Threshold 3: from "Some of the time" to "Most of the time"

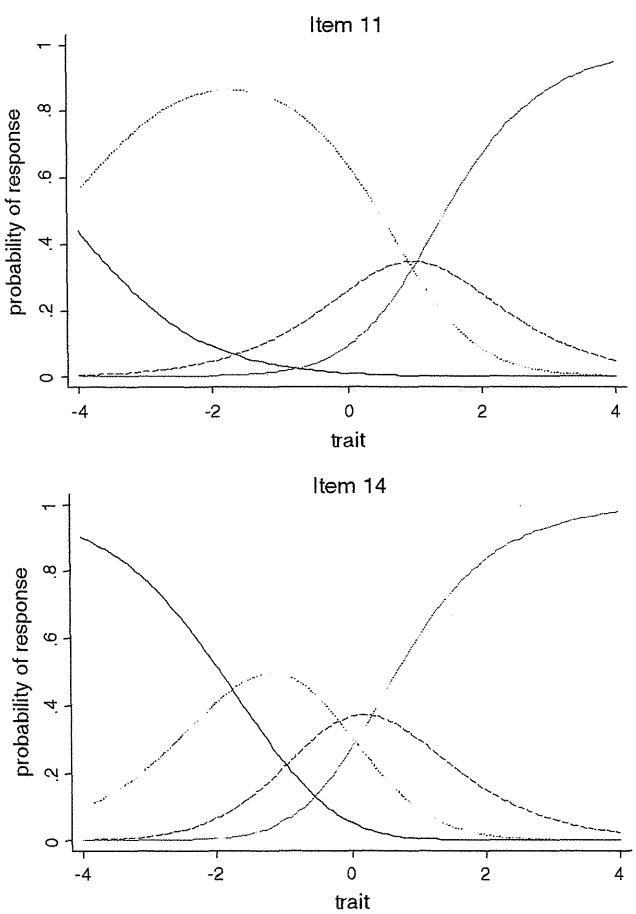

Fig. 2 Item characteristics curve of selected items. *Horizontal axis* Level of trait (or quality of life), *vertical axis* probability of response for each response choice, *blue line* the first response "None of the time", *dotted red line* the second response "A little of the time", *Green line* the third response "Some of the time", *orange line* fourth response "Most of the time."

almost perfect linear relationship between the two scores. Thus, we can recommend the original scoring algorithm for simplicity.

Our results also suggest the possibility of further item reduction without any loss of measurement range. However, further testing with a broader range of patients may be necessary because the item response pattern would be different across the characteristics of patients.

We have demonstrated that the proposed modification of the FIQL scale had satisfactory psychometric reliability and validity for the assessment of the psycho-social dimension of the quality of life among postoperative patients who had undergone intersphincteric resection for very low rectal cancer. However, whether our results can be applied to a broader range of patients with fecal incontinence remains to be tested and can only be clarified by additional studies. A larger number of patients with lower rectal cancer are treated with the conventional double stapling technique, which is also a sphincter-saving procedure, rather than ISR. Here, we focused on the impact of intersphincteric manipulation, which does have a major effect on postoperative anal function and subsequent impairment in defecation. However, even patients treated with the conventional double stapling technique have been found to show an increased frequency of defecation, which would affect the activities of their daily life.

Since our sample set of patients had a history of a relatively long postoperative period, we believe that an independent study should be performed on patients with a shorter postoperative period. Such patients may require a different module of items that may be more relevant to their daily life context as compared to items used for patients with a longer postoperative experience. In

particular, we expected that the difference in the impact of chosen operative types on the patient's quality of life would have been more salient in the early stage of the postoperative period. Among those subjects whose median postoperative period was >36 months, the FIQL score tended to be worse among those without pouch formation and with radiation than in those with pouch formation and without radiation. However, the operative types did not discriminate FIQL scores well (data not shown). It would appear that further study with a larger number of patients with various conditions is required to better understand the determinants of the quality of life following surgical treatment of very low rectal cancer.

In conclusion, we have proposed a modification of the FIQL scale for the assessment of QOL among patients who have undergone intersphincteric resection for very low rectal cancer. Among the patients tested, the modified scale exhibited a satisfactory performance in terms of conventional psychometric properties, and the item response pattern supported a single composite scale covering a sufficiently wide range of impact due to incontinence. These results suggest that the proposed modified scale will be a useful tool by which to measure the quality of life impact of incontinence among patients who have undergone ISR. Further studies are needed on patients in early postoperative stages and with other clinical and therapeutic conditions to obtain a relevant item module that may better fit the unique needs of patients who suffer fecal incontinence.

Conflict of interest statement The authors claim no conflict of interest.

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Anal Function and Intersphincteric Resection

To the Editor—We read with great interest the results of Ito et al[1] regarding anal function after intersphincteric resection (ISR) for very low rectal cancer. In the multivariate analysis, preoperative chemoradiotherapy was found to be the only independent factor associated with poor anal function. Another finding of interest was the overall recurrence rate of 13%, which is relatively higher than other ISR studies.[2] Several points warrant discussion. The authors mention that lateral lymph node dissection was generally performed for T3 and T4 tumors. This reflects the practice of several major Japanese centers.[3] Second, 41% of patients with advanced tumors received preoperative chemoradiation, consisting of 45 Gy and continuous 5-fluorouracil. Surgery was performed 2 weeks after completion of chemoradiotherapy. Third, partial resection of the external anal sphincter (EAS) was performed in addition to ISR, if it was found to be involved with tumor. This was performed in approximately 22% of patients.

In most Western institutions, preoperative chemoradiation consists of either short-course (25 Gy in 5 fractions, followed immediately by surgery)[4] or long-course (40–50 Gy in 20–25 fractions, followed by surgery 6 weeks later) schedules.[5] It is not unreasonable to assume that the authors may have observed inferior anal function as a result of surgery performed at a shorter interval (after conventionally dosed radiation therapy) than usually performed. In most series, involvement of the external anal sphincter or the puborectalis complex is considered a contraindication to performance of ISR.[6] It would be of great interest to examine the oncological outcome in the patients with EAS involvement, as well as any association it may have had with the higher recurrence rate observed in the study.

In conclusion, Ito et al[1] have made yet another important contribution to the ISR literature, and we await further results from their group with great interest.

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The Authors Reply

To the Editor—We thank Drs Spanos and Syrakos for their interest in our report, and we would like to comment on their opinions. They pointed out some issues in relation to our results concerning intersphincteric resection (ISR) following preoperative chemoradiotherapy (CRT), in particular, that the recurrence rate of 13% in our series was higher than in other published studies.

In large Japanese hospitals, lateral lymph node dissection is performed for cancer of the low rectum in patients with clinical stage II or III disease, and we performed lateral lymph node dissection based on these criteria in our study. Because the Japanese Clinical Oncology Group is currently investigating the effect of lateral lymph node dissection on tumor recurrence and survival in clinical stage II and III cases, we cannot describe the relationship between local recurrence and lateral lymph node dissection yet. However, most of the local recurrences after ISR in our series were in patients with lateral lymph node metastasis.

The long-term results of the Swedish and Dutch study after total mesorectal excision (TME) following preoperative radiotherapy showed overall local recurrence rates of 5.6% and 9%, respectively. In some Western countries, not only tumors up to 15 cm from the anal verge, but also T1 and T2 tumors have been treated surgically after CRT. We

believe that, because local recurrences were found in few patients with cancer in the upper third or middle third of the rectum and with T1 and T2 cancer in the lower third of the rectum, neoadjuvant CRT was restricted to only the patients with stage T3 or T4 and N-positive disease of low rectal cancer. Moreover, patients with T3 or T4 very low rectal cancer lying on the anal canal had the highest rate of local recurrence after TME in our preliminary data. Therefore, the local recurrence rate after TME could vary according to number of patients with T3 or T4 cancer in the very low rectum near the anal canal. We propose that preoperative CRT should be performed only for patients with a high risk of local recurrence, because ISR plus preoperative CRT resulted in severe fecal incontinence in some patients. We do not know whether the higher local recurrence rate in our study was because 41% of the patients had stage III or more disease and 58% of the patients did not receive preoperative CRT.

Drs Spanos and Syrakos also pointed out that the poorer anal function we observed may have been attributable to the shorter interval after conventional radiotherapy. We cannot give clear answers to their questions, but we cannot agree that anal function would have been better preserved if ISR had been performed 6 to 8 weeks after CRT. Our preliminary study showed that patients with a complete response after CRT had poorer anal function than those with a partial response or stable disease. Although an interval of 6 to 8 weeks after conventional CRT is expected to offer more effective tumor response than a short interval, better tumor response by CRT does not always lead to better postoperative anal function.

Partial resection of the external anal sphincter (EAS) was performed in 22% of the patients in our study. We usually repaired the defect in the sphincter after partial resection of the EAS, and our study showed that partial resection of the EAS without preoperative CRT had a less adverse impact on postoperative anal function. However, most patients who required partial resection of the EAS had T3 or T4 tumors lying on the anal canal that should be treated by preoperative CRT plus surgery. We still do not have a clear answer to the question as to which should be chosen for such patients with a high risk of local recurrence, abdominoperineal resection or ISR with partial resection of the EAS. A prospective phase 2 trial of ISR is underway in Japan, and we will be able to comment on the indication of ISR for T3 or T4 rectal cancer near the anal verge next year.

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Poor Quality of Life in Patients Undergoing Total Colectomy and Ileorectal Anastomosis for Intractable Slow-Transit Constipation

To the Editor—I congratulate O'Brien et al[1] for raising the issue of sexual abuse as a determinant of outcome after colectomy for slow-transit constipation (STC). STC is indeed a multifactorial syndrome, where the hidden psychological sphere seems to play a significant role.

I would like to add my personal experience to this valuable study. When I was working in the department of surgery at the University of Brescia (Italy), we conducted an internal audit to analyze the postoperative quality of life (QoL) and satisfaction in 15 patients (14 female) undergoing total colectomy and ileorectal anastomosis for intractable STC. The STC group was compared with 2 different cohorts of patients undergoing the same surgical procedure but for different diseases: 10 patients with Crohn's disease and 10 patients with multiple synchronous colorectal carcinomas (Table 1). Self-reported QoL was assessed by use of the validated Short Form-36 Health Survey (SF-36) questionnaire (values ranged from 0 to 100, with low values representing higher patient discomfort).[2] In addition, patients were asked to rate their present perceived health status compared with the preoperative period as worse, unchanged, improved, or greatly improved. We did not formally investigate sexual abuse.

STC patients revealed a significantly poorer QoL in most of the physical, social, and psychological domains compared with patients with Crohn's disease and even cancer (Fig. 1). Surprisingly, when the STC patients were asked to rate their satisfaction compared with the preoperative period, 14 of 15 (93%) patients believed that their health status was improved or greatly improved. In agreement with O'Brien et al, our observations show that the surgical treatment successfully improved the symptoms in most of the cases. The poor postoperative QoL reported by STC patients, although apparently paradoxical, may be the consequence of a problematic psychological background.

TABLE 1. Patient characteristics

	STC (n = 15)	*Crohn's (n = 10)*	*Multiple synchronous cancer (n = 10)*
Sex, male/female	1:14	5:5	7:3
Age (y), median (range)	56 (32–77)	50 (24–64)	67 (45–77)
Months since operation, median (range)	29 (6–55)	21 (6–96)	32 (9–47)

STC = slow-transit constipation.

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Preliminary Experience With Bladder Preservation for Lower Rectal Cancers Involving the Lower Urinary Tract

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Background and Objectives: The aim of this study was to evaluate the feasibility of en bloc colorectal resection combined with radical prostatectomy as an alternative to total pelvic exenteration (TPE) for patients with locally advanced rectal cancer involving the lower urinary tract organs.

Methods: Twenty men with primary rectal cancer clinically involving the lower urinary tract organs underwent extended colorectal resection combined with radical prostatectomy. Data were entered prospectively into a database. Oncological and functional outcomes were analyzed.

Results: Anal sphincter-preserving operation (SPO) with radical prostatectomy was performed in 12 patients, abdominoperineal resection with radical prostatectomy in 8, and urinary reconstruction in 16. Morbidity and mortality rates were 35.0% and 0%, respectively. Five-year overall and disease-free survival rates were 83.6% and 42%, respectively. The cumulative 5-year local recurrence rate was 20.0%. All patients with urinary reconstruction achieved good voiding function, and patients with SPO showed acceptable anal function.

Conclusions: For lower rectal cancers involving lower urinary tract, en bloc rectal resection combined with radical prostatectomy appears oncologically acceptable and can reduce the number of TPEs.

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KEY WORDS: **total pelvic exenteration; abdominoperineal resection; intersphincteric resection; radical prostatectomy; cysto-urethral anastomosis**

INTRODUCTION

The standard surgery for locally advanced rectal cancer located within 5 cm from the anal verge is abdominoperineal resection (APR) [1]. With tumor involvement of the base or trigone of the bladder and of the prostate, total pelvic exenteration (TPE) may be required to achieve negative margins [2]. These patients often require double stomas, one for urinary diversion such as an ileal conduit, and another for fecal diversion such as a sigmoid colostomy. This procedure may thus compromise quality of life.

Recent advances in sphincter-preserving operations (SPO) including intersphincteric resection (ISR) and ultra-low anterior resection (U-LAR) for very low rectal cancer have allowed colo-anal anastomosis (CAA) or colo-anal canal anastomosis to be performed without adverse effects on outcome [3–7]. Furthermore, neobladder construction has also become a standard surgery following cystoprostatectomy for invasive bladder cancer [8,9]. Conversely, en bloc radical prostatectomy seems to represent an option in selected patients who would otherwise need TPE for locally advanced rectal cancer involving the prostate [10–13]. In this procedure, the bladder is preserved to allow voiding via the urethra with urinary continence. Together, these advances may improve postoperative quality of life for patients with locally advanced rectal cancer requiring TPE, enabling surgery to be performed without a stoma or with only a single stoma [14–17]. These approaches have been explored as alternatives to TPE in 20 patients with locally advanced primary rectal cancer at our institute since 2001.

In this prospective study, radical prostatectomy for locally advanced primary rectal cancer was evaluated clinically. The current series differs from the original in the number of patients excluding recurrent cases, longer follow-up, and use of a scoring system for anal function [17]. Informed consent was obtained from all patients, and institutional review board approval for this study was also obtained. This study has been performed in accordance with the Helsinki Declaration of 1975 and 1983.

METHODS

Patients

Between January 2001 and December 2008, a total of 20 patients with locally advanced primary rectal cancer clinically involving the prostate underwent extended colorectal resection combined with radical prostatectomy at the National Cancer Center Hospital East. All 20 patients were originally considered candidates for TPE. However, the urinary bladder was preserved in 20 patients as an alternative to TPE. Although preoperative radiochemotherapy for resectable rectal cancer is not a standard protocol in Japan, four

Abbreviations: APR, abdominoperineal resection; TPE, total pelvic exenteration; SPO, sphincter-preserving operation; ISR, intersphincteric resection; U-LAR, ultra-low anterior resection; CUA, cysto-urethral anastomosis; CAA, colo-anal anastomosis.

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