The Michel Benoist and Robert Mulholland yearly *European Spine Journal* Review: a survey of the “medical” articles in the *European Spine Journal*, 2009

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Introduction

The year 2009 has been one of innovations in the *European Spine Journal*. Three important new projects have been presented by M. Aebi, Editor in Chief of the journal in three editorials published in the March, May and August issues. They consist of the formation of a Chinese Section Editorial Board, the creation of an Open Operating Theater, and of Grand Rounds. The two latter innovations strongly reinforce the educational role of the journal.

Since 2004, at the end of each year Bob Mulholland and I have worked together to make a “readers’ digest” of the articles published throughout the year. As usual there are more surgical than medical papers. However, we hope that our selection for this year is as exhaustive and complementary as possible. Among the medical articles I have selected those which appear to have the best clinical

relevance. There are of course many other papers, which are just as good.

Osteoporotic vertebral fractures

In a previous study, Suzuki et al. [24] published a long-term clinical course of vertebral body fragility fractures observed in 107 patients admitted to the emergency unit of a university hospital for a painful radiologically vertebral fracture without any trauma or with a low-energy trauma. The 107 participating patients were followed at 3.6 and 12 months, using three validated questionnaires: the Von Korff pain-intensity and disability questionnaire, the Hanover ADL score, and the EQSD health-related quality of life measurement. In spite of some limitations, the results of that study indicated that such fractures have a high, severe impact on pain, disability, and quality of life lasting at least 1 year.

In the January 2009 issue of the journal, the authors published a complementary article [25] analyzing not only the evolution of the questionnaires’ results, but also the fracture type and grade of fracture deformation. A multiple linear regression analysis evaluated the influences of combined effects factors. Grade of fracture deformity in the three fracture types (wedge, biconcave, crush) is evaluated according to a semi-quantitative system, visually illustrated. Conclusions of the study indicate that the factor significantly associated with the worst disabling condition was the severity of the fracture deformation. Wedge and biconcave fractures had a better functional prognosis, as did the lumbar fractures compared to the thoracic ones.

This study has limitations, acknowledged by the authors, especially the absence of imaging follow-up. However, information provided here can be of help for decision-making of vertebroplasty.

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The paper by Hoshino et al. [10] in the September issue deals with a particular subgroup of OVF with insufficient bone union following the fracture. Forty-five patients were retrospectively studied. Insufficient bone union was detected on an intravertebral vacuum cleft on X-rays and CT, along with a fluid collection on T2-weighted MRI within the vertebral body. Local kyphosis, angular instability and ratio of occupation by bony fragments of the spinal canal were calculated. Severities of neurological deficits and of back pain were graded on three levels. Overall, 46.7% of patients had mild or severe neurological deficits and 84% had moderate or severe back pain. Statistical analysis showed that the factor affecting both the severity of back pain and of neurological deficits was angular instability of more than 15°. Severity of the neurological deficit was also affected by the ratio of occupation by the bony fragments in the spinal canal of more than 42%. There is an interesting discussion and review of the literature as well as therapeutic considerations.

Vertebroplasty and kyphoplasty

An interesting prospective study has been performed by Lovi et al. [14], presented in the June supplement, to evaluate and compare efficacy and safety of vertebroplasty (VP) and kyphoplasty (KP) in the treatment of osteoporotic vertebral fractures (OVF). In a consecutive series of 164 patients, one of the two treatments (VP or KP) was offered to the patient after 1 month of failed conservative therapy according to an algorithm designed by the authors, taking into account time from fracture and amount of vertebral body collapse (VBC). Schematically, KP was performed when VBC was over 30% between 1 and 3 months, whereas VP was performed when VBC was inferior to 30% during the same period. 118 (69.5%) underwent VP and 36 (30.5%) underwent KP. In the discussion the authors describe in detail the rationale of the algorithm. This strategy appears to have been successful in the hands of the authors. The clinical outcome evaluated on VAS and ODI was satisfactory at 1 month and at 2-year follow-up. Results in terms of VAS and ODI scores were similar among treatment groups. The rate of complications was low. The choice of only 1 month of conservative treatment can be challenged, and the appropriate timing of application of vertebroplasty or kyphoplasty has not yet reached a consensus.

Osteoporotic vertebral fractures: value of MRI prior to kyphoplasty

The paper by Spiegl et al. [23] published in the September issue reports the conclusions of a study aiming at identifying

the best imaging prior to kyphoplasty. As MRI, especially the STIR sequence, is very sensitive in detecting vertebral edema resulting from fresh fractures, the authors hypothesized that MRI should be superior to X-ray and CT scan in accurately pinpointing the vertebral bodies to be treated and in distinguishing fresh fractures or microfractures from old fractures. The report concerns 28 patients treated by balloon kyphoplasty for OVF with a total of 40 vertebral bodies. A CT scan was performed initially and a therapeutic plan determined according to the clinical and CT findings. In a second step, an MRI with STIR sequences was performed preoperatively. Indeed, the therapeutic plan was changed according to the MRI findings in 16 out of the 28 patients. Changes consisted principally in additional levels of kyphoplasty, or in canceling treatment at levels considered as old fractures. This paper provides valuable information. Unfortunately, the authors do not mention whether the final therapeutic program was successful.

Vertebroplasty: about sense and nonsense of uncontrolled “controlled randomized prospective trials”

The study by Buchbinder et al. [3] published in the *New England Journal of Medicine* in 2009 is titled “A randomized trial of vertebroplasty for painful osteoporotic vertebral fractures”. The conclusions of this study are that “no beneficial effect of vertebroplasty over a sham procedure was found at 1 week, 3, or 6 months in patients with painful osteoporotic vertebral fractures”. The fact that this study was accepted in a prestigious scientific journal and disseminated in the general press has generated worldwide reactions among clinicians who have been using this technique for such indications for years. Satisfying results of vertebroplasty have been shown in several good but not controlled randomized studies. However, scientific evidence is now based on randomized prospective studies. But they must be of high quality. The editorial by M. Aebi in the September issue [1] demonstrates that because of the poor methodology, results of Buchbinder’s study are highly questionable. I strongly recommend reading this editorial which also calls for future multicenter studies including prospective observational surveys in the form of a registry. Natural evolution of osteoporotic vertebral fractures is highly variable among individuals and involves many parameters such as the type of fractures, their location, the evolution of the kyphosis and the threat of neurological complications. Another important but not yet resolved problem is determining the best timing for vertebroplasty.

Sacroplasty for osteoporotic sacral fractures

Sacral osteoporotic fractures are frequent especially in elderly women and are a cause of prolonged disability and immobilization, thereby worsening osteoporosis. Vertebroplasty has been demonstrated to be efficacious in the treatment of osteoporotic vertebral fractures. Therefore, a few authors have used cement augmentation techniques in order to reduce pain and to obtain ability to ambulate and perform activities of daily living. However, information on this subject is still scarce and there is a lack of consensus on the technique as well as on the results and complications of sacroplasty. The article by Bayley et al. [2] in the September issue is particularly useful and includes important information. It is a comprehensive review of the literature which discloses that few articles have been published which provide the clinical results. In this article the reader will find a summary of 15 studies, mostly case series or technical reports, showing that sacroplasty is usually followed by pain relief prolonged at long term with minimal complications. In order to reach a consensus on the optimal technique and considering that most studies include a small number of patients, the authors recommend prospective clinical studies with an independent observer.

Ankylosing spinal disorders

The paper by Westerveld et al. in the February issue [27] is a comprehensive review of spinal fractures observed in patients with ankylosing spondylitis (AS) and with diffuse idiopathic skeletal hyperostosis (DISH). In total, 345 AS patients out of 76 included articles, and 55 DISH patients out of 17 articles were the subject of the review. All papers were assigned grade 4 level evidence. The review is a good reminder that fractures in ankylosed spines are often consecutive to a minor trauma. Consequently, the diagnosis is often delayed, especially in the case of DISH patients, because of the low awareness of this condition and of its risk of fractures. For the same reason many patients present with a neurological deficit, as the pain related to the fracture is not easily distinguishable from the pain related to the disease. The rate of neurological deficit at admission is particularly high in AS (67.2%) versus 40% in DISH. Some other interesting points are highlighted: the majority of the fractures are at the cervical level, sometimes difficult to interpret on radiographs, and tend to be unstable. Results of surgical and conservative treatment as well as complications are indicated in detail with comprehensive tables. As discussed in the Reviewer's comment [12], the two methods of treatment cannot be properly compared since the conditions of the patients assigned to surgery or to conservative treatment are quite different. The main message

of the paper is that patients and physicians should be aware that the risk of missed spinal fractures is high in AS and in DISH.

Timing of surgery for sciatica

There is a consensus that surgery for sciatica related to a discal herniation is of proven efficacy. There is also a consensus that surgery should be performed after a period of conservative treatment, considering that herniations can regress over time without surgery and that lumbar herniations can be seen in asymptomatic individuals. It has also been demonstrated that the 1–2 year outcome of early surgery is similar to conservative treatment with surgery if needed. However, the reasonable timing of surgery for sciatica is not clear. The paper by Paul et al. [18] published in the April issue is particularly interesting as it aims at determining whether baseline variables could influence the rate of recovery. A randomized study which included 283 patients compared the early surgery to prolonged conservative treatment and analyzed the effects of a long list of predefined prognostic variables: classical demographic, clinical and imaging. Worsening of leg pain by sitting versus no worsening was one of these. Results of the study are somewhat surprising, as classical signs did not show any contribution in deciding when to operate for sciatica. However, treatment effects of early surgery are increased when sciatica is provoked by sitting, and negligible when absent. There is an interesting discussion pointing out the bias of the study. As recommended by the authors, a simple question may help clinicians and patients to decide the best timing for surgery.

Lumbar traction for low-back pain

Efficacy of lumbar traction for low-back pain has been seriously discussed, and most guidelines do not recommend the use of traction as a physiotherapy modality to treat low-back pain. The paper by Cai et al. [4] in the April issue is interesting as it concerns a well-defined subgroup of patients with low-back pain extending to the buttock and lower extremity. A total of 129 patients participated in the study. Intervention consisted of three lumbar traction sessions using a motorized mechanical lumbar traction system, the patient being in supine position with hips and knees at 90° flexion. Outcome measures were based on numeric pain scale, fear-avoidance beliefs questionnaire and ODI. In all, 25 out of 129 patients had a positive result. Numerous variables were compared between responders and non-responders. Four predictors of positive response were identified. They included no neurological deficit,

low-level fear-avoidance beliefs, non-involvement in manual work, and age over 30 years. This study merits consideration as the subgroup of patients is well-defined. Unfortunately there is no long follow-up and duration of the treatment benefit at long term is not known.

Periradicular steroid infiltration for radicular pain

A number of studies have investigated the efficacy of epidural and periradicular infiltration for radicular pain, with controversial results. The article by Tafazal et al. [26] in the August issue deals with this still unresolved problem. The authors have compared the efficacy of periradicular infiltration in 124 patients with either a discal herniation ($N = 76$) or stenosis ($N = 48$). Patients were randomized in two groups to receive either 2 ml of buvicaine or buvicaine plus 40 mg of methyl-prednisolone. Treatment was performed under fluoroscopy and a neurogram was obtained. Patients were evaluated at 6 weeks, 3 months, and 1 year using VAS scale and ODI. At 6 weeks and at 3 months the change in ODI was identical in the two groups; the reduction of roughly 10% was considered by the authors as clinically significant. Similar findings were observed concerning the change of the VAS score. Subjective findings disclosed 54% of excellent and good results in the discal herniation group and 42% in the stenosis group. Results at 1 year were based on whether additional root block or surgery had been needed. Statistical analysis of the results did not show any significant difference between the buvicaine only and buvicaine plus steroid group. Overall, only 23 participants had been operated at 1 year. The fact that adding steroid to buvicaine did not clearly modify the results is certainly intriguing, raising the question of the natural evolution of the disease and of a possible therapeutic (anti-inflammatory?) long-term effect of buvicaine. In this regard one can regret that the location and evolution of the discal herniation itself is not described.

Imaging of the lumbar canal

The paper by Hansson et al. [9] in the May issue deals with the changes in the size of the lumbar canal when comparing MRI obtained in supine position to a loaded MRI. The authors also intended to evaluate the respective role of the disc and of the ligamentum flavum in the narrowing of the canal under load. Axial loading of the spine was performed with a non-magnetic, previously validated compression device. The differences between unloaded and loaded MRI were examined in 24 individuals, with a mean age of 44 years, consulting for LBP with or without pain radiating in the legs, and without a specific diagnosis. Spinal

canal cross-sectional area, thickness of the ligamentum flavum, and sagittal disc bulge were measured and compared with and without a load approximately corresponding to half the body weight. Interestingly, bulging of the ligamentum flavum had a major role in the narrowing of the canal, representing 50–80% of the narrowing. According to the authors, this could explain the beneficial effects of devices separating the interspinous processes in treatment of lumbar canal stenosis and of the laminotomy resecting the ligamentum flavum. The same remark could apply to the minimally invasive microendoscopic decompressive surgery whose indications, technique and results are discussed in an article published in the same issue of the journal.

Imaging of the cervical foramen pathology

The study by Shim et al. [19] in the August issue deals with the difficulty in accurately detecting pathology in the foramen by MRI. This difficulty which may cause errors of diagnosis is related to the anatomy of the cervical foramen and the limitations of conventional MRI. Considering the anatomic features of the foramen directed at an approximately 45° angle with respect to the coronal plane, the authors hypothesized that an angle sagittal MRI oriented to the real course of the foramen would be a better imaging strategy to detect lateral discal herniation or stenosis. In order to verify their hypothesis, the authors reviewed retrospectively imaging of 43 patients operated by anterior discectomy and fusion where a clear etiology (discal herniation or stenosis) was disclosed during surgery. Preoperative imaging comprising both a conventional MRI and an angled MRI was then compared with the operative findings. Results are provided in detail. In this study overall angled MRI was more accurate than conventional MRI in detecting a lateral pathology. In spite of its limitations (small number of patients, retrospective design), this study is thought-provoking. There is a good discussion concerning the use of CT or MRI in this pathology and an analysis of the literature.

Rheumatoid arthritis and sleep apnea

This paper by Shoda et al. [20] published in the June issue deals with the prevalence of sleep apnea in a subgroup of rheumatoid patients with occipito-cervical lesions. The patient population comprised 29 subjects planned to undergo surgery for severe occipito-cervical lesions causing myelopathy. Prevalence of sleep apnea defined as a repetitive cessation of breathing during sleep was very high in this group of RA patients with occipito-cervical lesions: 79 compared to 9–28% in the general population and to

53% of general RA patients. Occipito-cervical lesions were analyzed. Short neck and small atlanto-dental interval were the radiological parameters associated with sleep apnea implicating vertical translocation of the cervical spine. The type of sleep apnea was investigated and was classified as obstructive type or as central type. There is an interesting discussion of the mechanisms of the impact of RA cervico-occipital lesions on sleep apnea as well as the impact of sleep apnea on cardiovascular disease and mortality rate. This paper should be read carefully by rheumatologists and surgeons dealing with RA patients.

Whiplash

In a very interesting and well-structured article appearing in the June issue, Ozegovic et al. [16] have studied the relationship between expectation to return to work after a whiplash accident (Do you think that you will recover enough to return to your usual job?), and self-perceived recovery during the first year after the whiplash traumatism. In total, over 2,300 injured individuals meeting the appropriate criteria described by the authors entered in the study. The majority (66%) answered that they expected to be able to go back to work; 32% did not know, and only 1.8% did not expect to return to their usual job. An appropriate statistical analysis assessed the association between expectations and time-to-recovery. Potential confounders of the relationship listed in the article were also assessed and a final model adjusted for the identified confounders was developed. The overall results of this study show that a positive return-to-work expectation had a 42% faster rate in recovery, self-reported with no recurrence, than those with a negative expectation. These results are also important as expectations can sometimes be modifiable, as seems to be the case for whiplash, through education, advice of benignity, and reassurance.

Interspinous spacers

X-stop device is still presented as an alternative to surgery but previous studies have disclosed controversial results. The paper by Kuchta et al. [13] in the June issue of the journal is more optimistic than others. The authors have studied 175 patients with intermittent claudication related to lumbar spinal stenosis. Indication to use this technique instead of the decompression operation was mainly based on the fact that the leg pain disappeared completely when the lumbar spine was in flexion, with exacerbation when in extension. Usual contraindications were applied including

degenerative spondylolisthesis. Results appreciated on VAS and ODI were regularly evaluated for 2 years. VAS analog scales and ODI measurements improved postoperatively. For example, the mean VAS score was reduced from 61.2 to 39% at 6 weeks postoperatively, the same score persisting at 24 months. The same progression persisting over time was recorded on the ODI score. There was no complication but the device had to be removed because of clinical failure in eight patients. The originality of this study is that the selection of patients was essentially based on the positional-dependent claudication. Functional MRI performed in some patients was able to demonstrate the positional-dependent stenosis, including stretching of the ligamentum flavum, which is probably the main cause of compression in this category of patients.

A number of interspinous implants have been developed over the years aiming to limit the range of motion of the lumbar spine and improve its stability. An extensive literature exists on this subject. A novel implant, the Inswing, has been tested experimentally by Gunzburg et al. [7] on a sheep model. The article provides a good description of the implant and of the procedure. Interestingly, this device appears to be able to stabilize the spine in flexion which of course could be important in cases of degenerative spondylolisthesis.

Decompressive laminotomy for degenerative lumbar spinal stenosis

Classical laminectomy for treatment of lumbar spinal stenosis is usually successful in relieving radicular pain and neurogenic claudication. However, in elderly patients with various comorbidities and often multilevel stenosis, it is a long procedure with a lengthy anesthesia and risk of postoperative complications. Less invasive techniques have been proposed which could be beneficial in moderate stenosis, in order, for example, to excise the buckled ligamentum flavum when it is the predominant factor of compression. In this regard the paper by Pao et al. [17] is interesting. It deals with indications and results of 60 consecutive patients with moderate to severe stenosis, neurological symptoms and failure of conservative treatment. They were all operated by a microendoscopic decompressive laminotomy. The technique is described in detail. Approximately 80% of patients were satisfied after a mean follow-up of 15 months with a similar rate of success when results were assessed by the JOA score and ODI. In spite of a high prevalence of medical comorbidities, the rate of complication was very low and no postoperative instability was observed. Further studies including long-term results are necessary to evaluate this procedure.

Rehabilitation for chronic low-back pain

An interesting and useful paper concerning rehabilitation programs for chronic low-back pain was published in the December issue. The article by Mannion et al. [15] deals with the beneficial effects of segmental stabilization exercises in the treatment of chronic low-back pain. It is a beautiful piece of research work, and I particularly recommend that it be read by clinicians and physiotherapists involved in the medical and physical treatment of chronic LBP. The aim of the study was to examine the influence of adherence to a program of exercises on the clinical outcome, and also to analyze the factors associated with adherence to the program. The program therapy and the type of exercises performed by the 37 CLBP patients are clearly described in detail, which is not always the case in similar papers of the literature. Individual and psychological parameters are evaluated in a questionnaire booklet. Adherence to therapy is evaluated according to a self-report diary to document the exercises performed at home. Assessment of the treating physiotherapist to document the patient's adherence during each therapy session is evaluated on an adequate validated questionnaire (SIRAS). Percentage of attendance at the sessions of the 9-week program is also incorporated in a multidimensional adherence index. Results indicate that the benefits of rehabilitation disclosed in the study depended essentially on the patient's exercise behavior at home. Moreover, and somewhat surprisingly, of all the personal and psychological characteristics examined, only male gender and exercise self-efficacy were significantly associated with adherence to therapy. The paper contains a good discussion of the findings as well as appropriate references to the literature.

Psycho-social intervention to improve low-back pain beliefs

Several studies have demonstrated that psycho-social education has a positive effect in influencing LBP beliefs in existing low-back pain, thereby improving the general prognosis of the LBP episode. The study by George et al. [6] focused on whether an educational program could also be beneficial as a primary prevention of LBP. The authors selected a military setting, considering that LBP is a frequent cause of disability during military training. The study is a randomized trial comparing 1,727 soldiers who received the educational program with 2,065 soldiers used as a control group. The educational program consisted of an interactive educational session at the beginning of the training, designed to decrease fear-avoidance beliefs. Furthermore, the intervention group received the “back

book”, already used in previous studies. The main primary outcome was the validated back-belief questionnaire (BBQ). Other measures were also used to assess psychological factors which could influence the answers to the BBQ. The preliminary results of this study are interesting, considering its randomized design. Although of a small effect size, a positive influence was disclosed in the intervention group contrasting with a slight deterioration in the control group. The main limitation of the study is the short duration (12 weeks) between the two measurements. It remains to be seen whether this beneficial effect on the subsequent reports at 2 years will allow broader conclusions.

The Walking Romberg Sign

I would like to draw the attention of the reader to an innovative test which appears to be very useful in clinical practice and especially in the diagnosis of cervical myelopathy. The paper by Findlay et al. [5] in the October issue deals with a modification of the traditional Romberg Test in which the patient is asked to walk a few meters with his eyes open, and then walk the same distance with his eyes closed. Positive Walking Romberg Sign is a marked instability while walking with eyes closed, consisting of swaying or falling or inability to finish the walk. The authors have studied the value of the Walking Romberg Test in 50 patients with clinically significant cervical myelopathy confirmed by MRI. Interestingly, the Walking Romberg Test was positive in 74.5% of the patients compared to the 34% positive in the traditional Romberg Test. Prevalence of positive Walking Romberg Test was second to Hoffman's reflex. Combination of the two latter tests was positive in 96% of the patients, showing a high sensitivity to detect clinically cervical myelopathy. Obviously, as indicated by the authors, the test could also be used in many clinical situations, for example in screening “fibromyalgia, bilateral carpal syndrome, complex shoulder and neck problems”.

Postoperative status of lumbar spinal stenosis

In a previous study Sinikallio et al. [21] had shown that dissatisfaction with life was strongly associated with depressive symptoms. In this consecutive article [22] published in the August issue the same authors have studied the life satisfaction of patients operated for lumbar spinal stenosis during the postoperative phase of up to 2 years. Life satisfaction score (LS) described in the text and the Beck depression inventory questionnaire were

assessed at 3, 6, 12 and 24 months in 102 operated patients assigned in two different programs of physiotherapy. Many other variables were also assessed, using, for example, the ODI and Stucki questionnaires. The majority of the patients had a good result in terms of pain and disability. However, 18 out of 25% of the operated patients who were dissatisfied preoperatively were still dissatisfied at the 2-year follow-up. Interestingly, the only predictor variable associated with the 2-year postoperative dissatisfaction was the depressive score, irrespective of the type of post-op physiotherapy. Consequently, the authors suggest that the LS score and the depression score should be assessed preoperatively to detect and treat accordingly the individuals at risk.

Posterior pelvic pain provocation test and pelvic girdle pain

A substantial number of women experience lumbo-pelvic pain during pregnancy, sometimes persisting after delivery. Manual tests related to pain provocation of the sacro-iliac joints are recommended but in order to appreciate their specificity and sensitivity, these tests must be applied in low-back disorders with a well-defined lumbar diagnosis. In the study by Gutke et al. [8] in the July issue, the posterior pelvic pain provocation test was evaluated in two groups of individuals: on the one hand 53 patients on a waiting list for discal surgery or 6 months after surgery, and on the other hand 57 women with a well-defined pelvic girdle pain during pregnancy or after delivery. Discal pathology in the former group was clearly established by clinical and imaging studies. The results are clear-cut: the posterior pelvic pain provocation test is negative in the group of patients with a well-defined lumbar pathology and positive in the group of pregnant women. The study comprises an interesting discussion and review of the literature as well as a proposal of guidelines to evaluate lumbo-pelvic pain. The authors also question whether validation studies are still needed to decide whether one or several test scores should be used as diagnostic criteria.

Spinal metastasis

Metastatic tumors can affect the spine without any other skeletal tumor site. In this case, when the primary site is unknown, the location of the primary tumor must be disclosed. The paper by Iizuka et al. [11] published in the October issue deals with this problem and aims at determining which examinations appeared to be useful in leading to the final diagnostic. Twenty-seven out of 43 patients were studied retrospectively. Inclusion criteria were laboratory

analysis including protein electrophoresis and a complete set of markers, a chest–abdominal–pelvic CT scanning, and a CT-guided biopsy. Hematologic as well as solid cancers were disclosed in the study. Myeloma, lymphoma, and prostate cancer (14 cases) had a marker (M-protein, SIL-2R, PSA) with high sensitivity and specificity. Eleven primary tumor sites were detected by CT scanning. Biopsy led to the final diagnosis in only 12 out of 17 patients. This is a small series, but it is a good reminder that appropriate laboratory tests and thoraco-abdomen-pelvic CT scanning lead to a correct diagnosis in the majority of this category of patients.

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