Pergamon

European Journal of Cancer, Vol. 34, No. 4, pp. 580–583, 1998

Printed in Great Britain
0959-8049/98 $19.00+0.00

PII: S0959-8049(97)10032-6

Short Communication

Clinical Efficacy of Ultrasound Guided Percutaneous Drainage of Abscesses in Patients with Leukaemia and Lymphoma

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Ultrasound guided percutaneous drainage (US-PD), a minimally invasive technique, has been reported as highly effective for the treatment of deeply located abscesses, particularly in immunocompromised patients. Therefore, we retrospectively studied its therapeutic efficacy and safety in a series of 14 patients with leukaemia and lymphoma. We collected the clinical and sonographic data of 14 patients with various types of leukaemia and lymphoma. These patients were consecutively observed in four clinical centres with long-term experience with ultrasound guided therapeutic techniques. The cases were analysed according to underlying disease, clinical features, location of the abscess, drainage technique, microbiological data and both short- and long-term outcome. In our series, 11 patients were treated with repeated ultrasound guided needle aspirations (US-NA) and 3 underwent catheter drainage (US-PCD). In 12/14 cases the procedure was successful (86%): the mortality rate was 14%. 5 patients died during the follow-up period because of the underlying disease, without abscess recurrence. No complications were reported. Our data suggest that ultrasound guided percutaneous drainage should be considered the first choice, minimally invasive procedure for the treatment of deeply located abscesses in patients with leukaemia and lymphoma.

Key words: ultrasonography, abscesses, percutaneous drainage, leukaemia, lymphoma
Eur J Cancer, Vol. 34, No. 4, pp. 580–583, 1998

INTRODUCTION

ULTRASOUND GUIDED percutaneous drainage (US-PD) has been demonstrated to be highly effective for the treatment of the deeply located abscesses. An important validation of this technique is found in the excellent short-term [1] and long-term [2, 3] results obtained in large series and reported in the literature. Therefore, the procedure is regarded as the first choice, minimally invasive, therapeutic technique in non-immunocompromised patients with deeply located abscesses. Since infections are frequent in patients with leukaemia and lymphoma given chemotherapy, and abscesses can occur in parenchymal organs, lung or soft tissues, the treatment of these can be very difficult and these patients are poor candidates for surgical intervention.

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Received 11 Feb. 1997; revised 12 Aug. 1997; accepted 19 Sep. 1997.

The ultrasound (US) guidance techniques allow a needle or a drainage catheter to be inserted into fluid collections throughout the body with minimal risk. It is therefore possible to perform abscess drainages even at the bedside [4] or in emergency rooms [5]. This provides more rapid and less expensive procedures and immediate treatment of critically ill patients. However, the results of this technique in severely immunocompromised patients are fragmentary and still not well defined [6, 7]. Therefore, we collected 14 cases of abscesses in patients with leukaemia or lymphoma treated with US-PD in four centres (Infectious Diseases Departments or Haematology Units) with the aim of evaluating its clinical efficiency and safety in this particular clinical setting.

MATERIAL AND METHODS

The study examined retrospectively the experience with US guided percutaneous drainage of abscesses in patients with leukaemia and lymphoma from four Italian Clinical

centres with at least 10 years experience with interventional percutaneous therapeutic techniques. Each centre collected the clinical and sonographic data of such patients treated consecutively between 1 January 1988 and 31 December 1994. All subjects underwent chemotherapy in the 4 weeks prior to occurrence of the septic complication, except one patient with hairy cell leukaemia who had the septic complication at the onset of his disease. In all cases, the diagnosis of abscess was made by ultrasonography and confirmed with computer tomography (CT). This imaging technique was employed with the aim of obtaining the best topographic evaluation of the collection for correct planning of the percutaneous treatment, but this was always performed with US guidance. In all centres, ultrasound examinations were conducted with up-to-date real time equipments with 3-3,5-5 MHz linear, convex or sector probes. Drainage procedures were performed as previously reported [2] either with the free hand technique or with guidance devices connected to the probe. After local anaesthesia with lidocaine, a preliminary diagnostic ultrasound guided fine needle aspiration biopsy (US-FNAB) was performed in all cases to evaluate the physical characteristics of the abscess content. One-step US-guided needle aspiration (US-NA) or catheter drainage (US-PCD) were both utilised on a case-by-case basis dependent on the decision of the operator. At the moment of the therapeutic procedure, all patients had a platelet count of more than 50 000/mm^3, partial thromboplastin time < 40 s, prothrombin time more than 50% of the normal control and fibrinogen assay more than 200 ng/ml. Platelet transfusions were never given in order to reach these values before the drainage. In case of US-guided needle aspiration (US-NA), the procedure was repeated one or more times every 3–5 days if necessary. A wide range of needle (16–22G) and catheter (5–12F) sizes were utilised according to the experience of each centre.

The aspirated material was routinely sampled for cytological examination, Gram stain and cultures for aerobic and anaerobic bacteria and fungi. Broad-spectrum antibiotic therapy (usually ceftazidime plus amikacin) was started empirically before execution of the procedure and subsequently modified on the basis of culture results and clinical response of the patient. The collected data were analysed according to the clinical findings, location of the abscess, drainage technique, underlying diseases, outcome and occurrence of complications. The results were defined as 'cure' when the patient was completely healed from the septic complication after the procedure. When US-PD resulted in improvement of the clinical status, but other procedures (i.e. surgery) were required for cure of the abscess, the result was defined as 'temporisation': otherwise, when the patient had no benefit from the procedure, the result was defined as 'failure'.

RESULTS

Data on 14 patients were collected (13 male 1 female, aged 24–82 years). Among these, 5 patients had acute myeloid leukaemia (AML), 3 had chronic lymphocytic leukaemia (CLL), 2 had non-Hodgkin's lymphoma (NHL: AIDS related), 2 had chronic myeloid leukaemia (CML), 1 had acute lymphoid leukaemia (ALL) and 1 hairy cell leukaemia (HCL). The clinical findings (including age, sex, underlying disease, symptoms, previous chemotherapy, leucocyte count, fever duration and results of blood cultures) are shown in Table 1. 8 patients (pts 2, 3, 5, 6, 10, 12, 13, 14) were considered to be severely ill (life-threatening disease) at hospital admission.

Coagulation parameters were normal in 2 patients (pts 3 and 11): mild to moderate thrombocytopenia (platelet count between 50 000 and 112 000/mm^3) was present in the other 12 patients: prolonged prothrombin time (50–67% of the controls) was present in 6 patients (pts 1, 4, 5, 6, 12, 14): partial thromboplastin time was prolonged (38 and 41 s) in 2 patients (pts 1 and 14): fibrinogen assay was more than 200 ng/ml in all cases. No patient showed signs (such as detectable fibrinogen degradation products in the blood) or symptoms of disseminate intravascular coagulation (DIC).

Table 2 summarises the diagnostic and therapeutic findings of our series of patients.

Table 1. *Clinical features of* 14 *patients with leukaemia and lymphoma suffering from a deeply located abscess*

n	Age and sex	Underlying disease	Symptoms	Previous chemotherapy	Neutrophil count (n/mm^3)	Fever duration (days)	Blood cultures
1	77, m	CLL	Abdominal pain	Clorambucil	4600	20	Negative
2	49, m	AML M2	Dyspnoea*	DAT	2800	25	Negative
3	51, m	HCL	Abdominal pain*	None	500	15	Negative
4	56, m	AML, M1	Hypotension, headache*	DAT	300	30	Negative
5	36, f	ALL	Abdominal pain*	Vincristine*, Prednisone*, Daunorubicin	2560	15	*E. coli enterobacter cloacae*
6	72, m	AML, M4	Vomiting, nausea*	ARA C* Etoposide	1200	10	Negative
7	55, m	CML	Right upper abdomen pain	Hydroxyurea	7800	20	Negative
8	63, m	CML	Septic fever	Hydroxyurea	8700	15	*Klebsiella pneumoniae*
9	70, m	CLL	Local pain	Chlorambucil + Prednisone	6700	25	Negative
10	24, m	AML M1	Dyspnoea*	DAT	1700	10	Negative
11	64, m	NHL	Left upper abdomen pain	CHOP	3800	8	*Staphylococcus aureus*
12	45, m	NHL; AIDS	Weight loss, abdominal pain*	CHOP	1350	20	Negative
13	67, m	CLL	Weight loss, pain*	Chlorambucil	9500	45	*Pseudomonas aeruginosa*
14	82, m	AML M4	Abdominal pain*	ARA C + Etoposide	400	30	Negative

ALL = acute lymphoid leukaemia, CLL = chronic lymphocitic leukaemia, AML = acute myeloid leukaemia (according to FAB classification), CML = chronic myeloid leukaemia, HCL = hairy cell leukaemia, NHL = non-Hodgkin's lymphoma. Patients 4, 5, 6, 11, 14 died because of underlying disease without clinical and sonographic signs of abscess recurrence. *Severely ill patient, with life-threatening septic complication. DAT = Daunorubicin plus ARA-C plus thioguanine. CHOP = cyclophosphamide plus doxorubicin plus vincristine plus prednisone.

Table 2. Sonographic features, drainage findings and outcome of 14 patients with leukaemia and lymphoma, suffering from a deeply located abscess

n	Location of the abscess	Abscess size	US abscess findings	Drainage technique	*n* of aspirations	Isolated bacterial fungi	Outcome	Follow-up duration (months)
1	Liver	5 cm	Left lobe, single	US-NA	2	*E. Coli*	Healed	60
2	Lung	6 cm	Subpleural	US-NA	3	*Staphylococcus aureus*	Healed	72
3	Abdomen	5 cm	Multiseptated, fistulized to GE tube	US-PCD	17 days*	*Enterococcus faecium*	Healed	72
4	Liver	2 cm	Multiple (3), both lobes	US-NA	3	*Aeromonas hydrophila*	Healed	6
5	Liver	5 cm	Single, right lobe	US-NA	4	*Staphylococcus aureus*	Healed	3
6	Liver	5 cm	(Multiple) right liver lobe and spleen	US-NA	4	Negative	Healed	2
7	Abdomen	6.5 cm	Left paracolic	US-NA	3	*Enterococcus fecalis*	Healed	11
8	Liver	6	Single, right lobe	US-NA	2	*Klebsiella pneumoniae*	Healed	14
9	Forearm	4	Deep location between radium and ulna	US-NA	3	*Staphylococcus aureus*	Healed	36
10	Spleen	2 cm	Multiple (3)	US-NA	2	*Aspergillus flavus*	Unchanged	Dead
11	Spleen	5.5 cm	Single	US-NA	2	*Staphylococcus aureus*	Healed	16
12	Abdomen	5 cm	Right iliac fossa	US-PCD	7 days*	*Mycobacter tubeculosis Hominis*	Improved	Dead
13	Empyema	5 cm	Pleural empyema	US-PCD	15 days*	*Pseudomonas aeruginosa*	Healed	6
14	Liver	5 cm	Single, right lobe	US-NA	3	*Enterococcus faecium*	Healed	6

US-NA = ultrasound guided needle aspiration, US-PCD = ultrasound guided percutaneous catheter drainage. *Duration of catheter drainage.

In 13/14 cases the US guided diagnostic puncture resulted in identification of the causative agent and administration of the appropriate antibiotic therapy.

11 patients were treated with repeated (every 3–5 days) US guided needle aspirations: 1–4 aspirations for each patient were necessary. In 3 cases, US guided catheter drainage was performed (5-12F catheters, left in place from 5 to 17 days) because of the presence of fistulisation to the small bowel (case 3), a huge collection with very dense content (case 12) and for treatment of a pleural empyema (case 13). In the whole series, the amount of aspirated material varied from 4 to 800 ml. 12 patients (10 with US-NA and 2 with US-PD) were cured of the abscess by the therapeutic procedure: in one case (pt 10) the procedure failed and the patient died because of sepsis, soon after splenectomy. This patient suffered from a myeloid acute leukaemia (M1 according to FAB classification): at necropsy the spleen showed a huge roundish mycotic lesion (*aspergillosis*): the US guided puncture correctly identified the organism and antimycotic therapy was promptly undertaken, but only 4 cm^3 of dense pus were obtained from the aspiration. In another patient (pt 12), suffering from an AIDS-related NHL, a drainage catheter was inserted in an abdominal fluid collection: a *Mycobacterium tuberculosis hominis* was isolated from the aspirated fluid: the patient showed a transient improvement in his clinical status, but he died 20 days later because of septic complications and cachexia. Therefore, in these cases death was due to septic disease. The surviving patients were submitted to a clinical and sonographic follow-up every 3 months to evaluate possible abscess recurrence.

Mean follow-up time was 21.8 months. During this time, 5 patients died because of their underlying disease (3 AML, 1 ALL, 1 NHL) after 2–16 months from the procedure without signs of abscess relapse. The others were followed from 3 to 72 months, without recurrence of the abscess. We obtained a cure percentage of 86 (12/14) with an abscess-related mortality of 14% (2/14).

In our series, complications due to US guided drainage were not observed. General anaesthesia was never used: in all cases only a local anaesthesia was administered before the drainage. Pain due to the procedure was minimal or mild and never required medication.

DISCUSSION

Treatment of the abscesses in patients with leukaemia or lymphoma is difficult. These patients are often severely immunocompromised because of their underlying disease, and because chemotherapy and/or radiotherapy can cause neutropenia. Therefore, severe bacterial infections (especially due to gram-positive bacteria) are frequent. Moreover, coagulation disturbances and low platelet count can make invasive therapeutic procedures difficult with a high risk of bleeding.

US-PD has been employed with good results in some difficult clinical situations, such as intensive care unit patients [8], severely immunocompromised [7] and even critically ill patients [9]. Another author [10] reported the use of percutaneous catheter drainage in 16 cases with infected abdominal tumours and 75% improved. Moreover, McGahan and associates have reported the possibility of performing aspirations and drainages at the bedside, by utilising portable real time sonographic systems.

These techniques must therefore be considered as a safe and efficacious therapy even for severely ill patients who cannot be transported outside the clinical department without risk. US guidance offers, in these cases, some advantages over CT, which is widely used in routine situations, particularly in the United States. In our study, CT guidance was never used for percutaneous drainage. None the less, CT is better than ultrasound for adequate mapping of the abdominal abscesses, detection of multiloculations [21] and evaluation of the parenchimal organs. Therefore, adequate planning of the percutaneous treatment, even with US guidance, should include a CT evaluation whenever possible. Moreover, in

some cases, ultrasonography can be unable to visualise clearly deeply located intra-abdominal collections, particularly in obese and large patients: in these situations, CT guidance is mandatory.

None the less, among more than 480 drainage procedures performed in our centres in the same period of the study, US guided drainage was safely performed in almost all cases and the need for CT guidance was exceedingly rare.

As we have shown, although US-PD was proposed in a variety of high-risk clinical situations, there is no specific information in the present literature on the results of ultrasound guided drainage in patients with leukaemia and lymphoma and only overall results in patients generically defined as 'immunocompromised' are reported in the largest series of the literature [3].

Some authors compared US-PD with surgical treatment for the therapy of abdominal [11, 12] and hepatic abscesses [13]. In both cases, the results were similar but US-PD showed less complications, better manageability and lower costs.

On this basis, US-PD offers the best opportunity to treat abscesses in our high-risk patients. In fact, the results of our study confirm the value of this technique, which showed high efficacy and safety. Moreover, the mean follow-up time of our cases appears to be long enough to ensure the reliability of our findings.

In our experience, US guided needle aspiration was more frequently employed than catheter drainage, particularly for hepatic or splenic abscesses. In these cases, US guided needle aspiration showed similar results and less complications than catheter drainage [14, 15].

It is important to note that US guided drainage cannot be employed for the treatment of mycotic abscesses, because these lesions are solid and do not contain drainable material. Moreover, they are frequently small and disseminate in the liver and the spleen. In these cases, US guided fine needle biopsy can be an optimal diagnostic procedure, allowing adequate, microbiology directed, antimycotic treatment [16].

Almost all (12/14) patients in this study showed moderately impaired coagulation parameters at the time of percutaneous drainage. None the less, we did not observe bleeding complications. Our chosen safety levels in coagulation assays seemed to be sufficient to ensure safe therapeutic procedures for almost all patients. It must be stressed that in our experience no patient was excluded tor US-PD because of coagulation impairment.

In conclusion, our findings confirm that US-PD must be considered the first choice, minimally invasive, therapeutic technique for the treatment of deeply located abscesses in patients with leukaemia and lymphoma.

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