High-dose CHOP plus etoposide (MegaCHOEP) in T-cell lymphoma: a comparative analysis of patients treated within trials of the German High-Grade Non-Hodgkin Lymphoma Study Group (DSHNHL)

M. Nickelsen1*, M. Ziepert2, S. Zeynalova2, B. Glass1, B. Metzner3, M. Leithaeuser4, H. K. Mueller-Hermelink5, M. Pfreundschuh6 & N. Schmitz1

1Department of Hematology and Stem Cell Transplantation, Asklepios Hospital St Georg, Hamburg; 2Institute of Medical Informatics, Statistics and Epidemiology, University of Leipzig; 3Clinic for Oncology and Hematology, Klinikum Oldenburg; 4Department of Hematology and Oncology, University of Rostock; 5Institute of Pathology, University of Wuerzburg and 6Department of Internal Medicine I, Saarland University, Homburg/Saar, Germany

Received 3 February 2009; accepted 13 March 2009

Background: T-cell lymphomas (T-NHL) generally carry a poor prognosis. High-dose therapy (HDT) and autologous stem cell transplantation (ASCT) are increasingly used to treat younger patients.

Design and methods: We treated patients <61 years with high-risk aggressive lymphoma with four to six courses of dose-escalated CHOP plus etoposide (MegaCHOEP) necessitating repeated ASCT. Outcomes of patients with mature T-NHL (excluding anaplastic lymphoma kinase-positive anaplastic large cell lymphoma) and aggressive B-NHL were compared using multivariate Cox regression analysis.

Results: Compared with 84.4% of B-NHL patients, 66.7% of T-NHL patients were able to receive all treatments; the rates of progressive disease were 27.3% in T-NHL and 16.3% in B-NHL patients. At 3 years, event-free survival (EFS) and overall survival were significantly worse for T-NHL (25.9% confidence interval (CI) 10.4% to 41.4% and 44.5% CI 26.5% to 62.5%) than for B-NHL patients (60.1% CI 52.1% to 68.1%; P < 0.001 and 63.4% CI 55.4% to 71.4%; P = 0.016). In multivariate analysis, T-NHL was a strongly significant adverse risk factor for EFS (relative risk 2.2, P = 0.001).

Conclusions: MegaCHOEP for T-NHL patients was no better than other high-dose regimens and was unable to address the major problems of HDT/ASCT: neither early progressions nor early relapses were reduced. This study sheds some doubt on expectations that HDT/ASCT will significantly improve outcomes for patients with T-NHL.

Key words: autologous transplantation, MegaCHOEP, T-cell lymphoma

introduction

In the Western world, 10%–15% of non-Hodgkin lymphomas are of T-cell origin [1]. The median age at diagnosis usually is >55 years and the majority of patients present with advanced disease [2–4]. Prognosis is generally poor: among 1314 cases of T-cell lymphoma reported to the International Peripheral T-Cell and Natural Killer/T-Cell Lymphoma Study, the 5-year failure-free survival and overall survival (OS) were 18%–36% and 32%–49%, respectively [1], when primary cutaneous and anaplastic lymphoma kinase-positive (ALK+) anaplastic large cell lymphoma (ALCL) were excluded. The T-cell phenotype conveyed a worse outcome as compared with B-cell lymphoma [2, 3] even before rituximab significantly improved the prognosis of aggressive B-cell lymphomas. The only exception is ALK+ ALCL which has a prognosis comparable to or even better than aggressive B-cell lymphomas [5, 6]. We and others demonstrated that patients with T-cell lymphoma receiving conventional chemotherapy do poorly [7–10]. Therefore, nowadays many patients receive high dose chemotherapy (HDT)/autologous stem cell transplantation (ASCT) as part of first line therapy. Many HDT studies, however, were retrospective and included only patients who actually received HDT. This clearly overestimates the role of HDT as first-line therapy because 30% or more of T-cell lymphoma patients progress or do not achieve complete response (CR)/partial response (PR) with conventional chemotherapy and thus will not proceed to HDT/ASCT [11, 12].

The MegaCHOEP protocol designed by the German High Grade Non-Hodgkin’s Lymphoma Study Group (DSHNHL) represents a new concept of HDT which delivers high doses and dose intensities of active drugs as early as possible after diagnosis [13]. This strategy has been successfully used in
younger patients with aggressive B-cell lymphoma [14]. Here we show that the efficacy of MegaCHOEP seems more limited in patients with mature T-cell lymphoma.

**design and methods**

**patients and methods**

Eligible patients had to have a primary diagnosis of aggressive lymphoma according to the World Health Organization (WHO) classification [15] confirmed by a panel of expert hematopathologists, stages II–IV disease, age 18–60 years, and high-risk disease as defined by a lactate dehydrogenase (LDH) level above the normal value (phase II studies) or an age-adjusted international prognostic index (aaIPI) ≥2 (phase III study). The study protocols were approved by the independent ethics committees at all participating sites and patients gave informed consent. Patients with lymphoma of the central nervous system, bone marrow infiltration >25% by histology, known HIV infection, or any major organ dysfunction were excluded. From January 1997 to February 2006, a total of 498 patients from 75 centers were enrolled into subsequent phase II trials [13, 14] and a phase III trial which is still running for aggressive B-cell lymphoma. (http://www.clinicaltrials.gov/ct2/show/NCT00129090). All consecutive 33 patients with mature T-cell lymphoma excluding ALK+ ALCL were analyzed. Results were compared with 147 patients with aggressive B-cell lymphoma who had been treated with MegaCHOEP [13, 14].

**staging**

Patients were staged according to the Ann Arbor criteria. Individual histories, physical examination, and blood tests were taken from all patients. We required a bone marrow biopsy as well as thoracic and abdominal computed tomography scans; further imaging procedures were optional. Other diagnostic procedures were carried out when clinically indicated.

**chemotherapy**

Three consecutive phase I/II trials were run by the DSHNHL in order to evaluate the feasibility, safety, and efficacy of the MegaCHOEP program. The overall results of dose levels (DL) I and II and DL III have been published [13, 14]. Briefly, chemotherapy consisted of either four courses (DL I, DL II, and DL III arm A) or six courses (DL III arm B) of cyclophosphamide (CY), adriamycin, vincristine, etoposide, and prednisone given at high doses and short time intervals (Figure 1). The doses of drugs varied between DLs and individual treatment courses as described. The last three courses of HDT were followed by transplantation of autologous blood stem cells which had been harvested after stimulation with granulocyte colony-stimulating factor after courses 1 and 2 (3 and 4 for DL III arm B) of MegaCHOEP. The 10 patients who were treated in the phase III trial received four cycles of MegaCHOEP at DL II.

**assessment of hematologic and extramedullary toxic effects**

Organ toxic effects were evaluated according to the Beartman criteria [16]; infections were classified using WHO criteria. Patients on DLs I and II were to receive the next course of MegaCHOEP as soon as they had achieved a platelet count >80×10^9/l, had cleared any active infection, and toxic effects of heart, bladder, kidney, lungs, central nervous system, gastrointestinal tract, and stomatitis were graded 0; liver toxicity could be either 0 or 1. Patients treated on DL III and on the phase III trial continued treatment on day 21 if toxic effects had resolved.

**response evaluation and definitions**

Response was assessed 3 months after therapy had ended. Patients with disappearance of all pathologic lesions for at least 2 months after final restaging were considered complete responders. Patients with lesions representing residual masses after therapy but no indication of active disease necessitating further therapy were classified as unconfirmed CR (CRu). PR was defined by a ≥50% regression at all tumor sites. Progressive disease was defined as tumor growth at least one site of more than 25%. Tumor regression of ≥50% at all sites or tumor growth of maximal 25% was defined as stable disease (SD). All patients who did not reach CRs at final restaging were deemed failures and were candidates for salvage therapy at the discretion of the treating physician. Routine positron emission tomography scans were not required.

**statistical analysis**

OS was measured from the beginning of therapy to death from any cause. Event-free survival (EFS) was defined as the time from the beginning of therapy to disease progression, initiation of salvage therapy, or additional (off-protocol) treatment, relapse, or death from any cause. Patients without an event in OS or EFS were censored. The Kaplan–Meier method was used to compare OS and EFS of B and T-cell patients. The estimators at 3 years are given with 95% confidence intervals. Differences between Kaplan–Meier curves were assessed using the log-rank test. Multivariate analysis of OS and EFS was carried out using the Cox proportional hazards model. We adjusted for the factors of the aaIPI: performance status according to the Eastern Cooperative Oncology Group (ECOG) classification (0, 1 versus ≥2) and stage (I/II versus III/IV). Serum LDH was not included because elevated LDH had been an inclusion criterion for the phase II studies. Binary data from the patient’s characteristics were compared using chi-square tests and, if required, Fisher’s exact tests. Age was compared using

---

*Figure 1.* Study design of MegaCHOEP dose levels (DLs) I and II. The etoposide doses of DL II are given in parentheses. At DL III patients received either 1 cycle with the dose of the first cycle of DLs I (yellow) followed by 3 cycles identical to the last cycle of DLs I and II (red, 4 courses total), or 3 courses of cycle 1 DL II (yellow) followed by 3 cycles identical to the last 3 cycles of DL II (orange and red, 6 courses total).
In the B-cell lymphoma group, 124 of 147 patients (84.4%) received all planned therapy. The reasons for stopping therapy early were as follows: progressive disease ($n = 2, 1.4\%$), extensive toxicity ($n = 16, 10.9\%$), protocol violation ($n = 2, 1.4\%$), mobilization failure ($n = 2, 1.4\%$), and other reason ($n = 1, 0.7\%$). Ninety-nine of 147 B-cell lymphoma patients (67.3\%) achieved CR/CRu, 7.5\% of patients had a PR ($n = 11, 0.7\%$) of patients experienced SD ($n = 1$), 24 patients (16.3\%) showed primary progressive disease, and six patients (4.1\%) had unknown response at the end of treatment; there were six therapy-related deaths (4.1\%). EFS at 3 years was significantly worse for T-cell (25.9\%, 95\% CI 10.4\% to 41.4\%) than for B-cell lymphoma patients (60.1\%, 95\% CI 52.1\% to 68.1\%; $P < 0.001$) as was OS (44.5\% [95\% CI 26.5\% to 62.5\%]) versus 63.4\% [95\% CI 55.4\% to 71.4\%], $P = 0.016, Figure 2). With a median follow-up of 4.4 years, 18 of 33 (54.5\%) T-cell lymphoma patients and 55 of 147 (37.4\%) B-cell lymphoma patients have died. The causes of death were as follows: lymphoma (15 T-cell lymphoma patients, 46 B-cell lymphoma patients, 45.5\% versus 31.3\%), therapy related (two T-cell lymphoma patients, five B-cell lymphoma patients, 6.1\% versus 3.4\%), lymphoma and therapy related (one B-cell lymphoma patient, 0.7\%), secondary neoplasia (two B-cell lymphoma patients, 1.4\%), intercurrent disease (one T-cell lymphoma patient, 3.0\%), or unknown (one B-cell patient, 0.7\%) (see Figure 3).

Of 14 patients with T-cell lymphoma who achieved a CR or CRu after receiving all planned treatment, seven patients relapsed 7–46 (median 10) months after start of treatment. All relapses were chemosensitive. Three patients achieved a second CR with

### Table 2. Patient characteristics

<table>
<thead>
<tr>
<th></th>
<th>T-NHL, n (%)</th>
<th>B-NHL, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>33</td>
<td>147</td>
</tr>
<tr>
<td>Median age (range)</td>
<td>48 (20–60)</td>
<td>46 (18–60)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22 (66.7%)</td>
<td>87 (59.2%)</td>
</tr>
<tr>
<td>Female</td>
<td>11 (33.3%)</td>
<td>60 (40.8%)</td>
</tr>
<tr>
<td>LDH above the normal value</td>
<td>32 (97.0%)</td>
<td>147 (100.0%)</td>
</tr>
<tr>
<td>ECOG &gt;1</td>
<td>12 (36.4%)</td>
<td>43 (29.3%)</td>
</tr>
<tr>
<td>Stage III/IV</td>
<td>28 (84.4%)</td>
<td>98 (66.7%)</td>
</tr>
<tr>
<td>aalPI 1</td>
<td>3 (9.1%)</td>
<td>39 (26.5%)</td>
</tr>
<tr>
<td>aalPI 2</td>
<td>21 (63.6%)</td>
<td>75 (51.0%)</td>
</tr>
<tr>
<td>aalPI 3</td>
<td>9 (27.3%)</td>
<td>33 (22.4%)</td>
</tr>
<tr>
<td>More than one EN sites</td>
<td>11 (33.3%)</td>
<td>52 (35.6%)</td>
</tr>
<tr>
<td>Extranodal involvement</td>
<td>27 (81.8%)</td>
<td>97 (66.0%)</td>
</tr>
<tr>
<td>Bulk ≥7.5 cm</td>
<td>8 (24.2%)</td>
<td>102 (69.9%)</td>
</tr>
<tr>
<td>B-symptoms</td>
<td>23 (69.7%)</td>
<td>89 (60.5%)</td>
</tr>
<tr>
<td><strong>MegaCHOEP treatment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase II trial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4× dose level 1</td>
<td>4 (12.1%)</td>
<td>31 (21.1%)</td>
</tr>
<tr>
<td>4× dose level 2</td>
<td>5 (15.2%)</td>
<td>61 (41.5%)</td>
</tr>
<tr>
<td>4× dose level 3*</td>
<td>10 (30.3%)</td>
<td>37 (25.2%)</td>
</tr>
<tr>
<td>6× dose level 3*</td>
<td>4 (12.1%)</td>
<td>18 (12.2%)</td>
</tr>
<tr>
<td>Phase III trial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4× dose level 2</td>
<td>10 (30.3%)</td>
<td>–</td>
</tr>
</tbody>
</table>

*Similar total doses, but different number of cycles.

LDH, lactate dehydrogenase; ECOG, Eastern Cooperative Oncology Group; EN, extranodal.
different salvage regimens (FCD—fludarabine, CY, and dexamethasone—and radiotherapy, MTX-based salvage therapy and allogeneic stem cell transplantation (SCT), gemcitabine-based salvage therapy, and allogeneic SCT, respectively) and are alive and well. Two patients died after allogeneic transplantation in PR or with unknown disease status. One patient was lost to follow-up early after salvage treatment; one patient (with T-lymphoblastic lymphoma) had a second meningeal relapse shortly after allogeneic SCT and died from lymphoma.

Nine of 11 patients with stable or progressive disease during or after MegaCHOEP received salvage therapy. Two patients achieved a CR: the first patient received five cycles of fludarabine and CY (FC) and died from lymphoma 41 months after diagnosis; the second died due to graft versus host disease and infections after allogeneic transplantation. One patient received different salvage regimens, never achieved a stable remission, and died from a lymphoproliferative disorder after allogeneic transplantation 21 months after diagnosis. Seven patients did not reach any stable remission; six died from lymphoma 2–9 months after diagnosis, one patient left Germany in progressive disease and was lost to follow-up.

Five of 11 patients who did not complete the MegaCHOEP program received CHOP-like treatment. Of these patients, one reached a CR (after one course of MegaCHOEP followed by five cycles of CHOEP-14), a second achieved CRu (after two courses of MegaCHOEP followed by four courses of CHOP-21). The second patient relapsed 10 months after diagnosis, reached second CR after autologous transplantation and died from cardiac disease in second relapse. Two patients achieved PR after CHOP-like treatment, received salvage therapy (ESHAP and radiotherapy, allogeneic SCT) and are in ongoing first CR. One patient had SD after one cycle of MegaCHOEP, two cycles of CHOP-14, and one cycle of CHP. He received FC salvage therapy and died from primary progressive disease. One further patient received six cycles of CHOP after one cycle of MegaCHOEP and reached a CR after BEAM consolidation. The patient relapsed and died 20 months after diagnosis.

**prognostic factors**

In a multivariate Cox model which analyzed EFS for the ‘histological subtypes’ T- or B-cell lymphoma, adjusted for the aaIPI factors ‘performance status’ and ‘stage III/IV’ (LDH had been an inclusion criterion for the phase II studies), the T-cell lymphoma patients had a 2.2-fold increased relative risk (RR) of any event ($P = 0.001$). The risk factors of the aaIPI were significant: the RR of patients with an ECOG $>1$ was 1.8-fold ($P = 0.007$), of patients with stage III/IV disease was 2.2-fold ($P = 0.006$) higher than in patients without these risk factors (Table 3).

**discussion**

The MegaCHOEP regimen was developed for younger patients with aggressive lymphoma and poor prognosis. The results for patients with B-cell lymphomas were promising [13, 14] and led to the design of a randomized phase III study comparing MegaCHOEP to an intensified conventional treatment regimen (CHOEP-14).
Here we present an analysis of T-cell lymphoma patients treated with MegaCHOEP. In contrast to 84.4% of B-cell lymphoma patients, only 66.7% of T-cell lymphoma patients were able to complete therapy as per protocol. This is comparable to other prospective HDT studies where the rate of patients proceeding to transplantation after conventional first-line therapy was between 41% and 74% [11, 12, 17–19], the main reason for early drop-out being primary progressive disease. The studies published by Corradini et al. [17], Reimer et al. [11], and Mercadal et al. [12] included ALK+ patients with a more favorable risk profile (aaIPI > 1 in 44%–72% of patients compared with 91% of patients, elevated LDH in 54%–63% of patients compared with 97% in our study, respectively). The rates of early failures in these studies were 24% [17], 30% [11], and 44% [12] resulting in 3-year OS of 48% and 50% [11, 17] and 4-year OS of 39% [12], respectively. Three- or 4-year progression-free survival was <40% in all these studies.

The rate of patients with progressive or SD under treatment was relatively low (12.1%) with MegaCHOEP, the CR/CRRu rate at restaging 3 months after end of therapy was only 48.5%; the rate of major progressive disease had increased to 27.3%. Furthermore, MegaCHOEP could not be completed in 18.2% of patients due to excessive toxicity. Patients with early treatment failure had a poor outcome. No patient with SD or progressive disease at restaging (n = 12) was finally cured. At the time of the analysis, only 10 patients were in ongoing first CR after MegaCHOEP (n = 7), CHOP-like therapy (n = 1), or alternative treatment (n = 2). These results are comparable to those from other studies: Rodriguez et al. [20] published a DFS of 60% for patients in CR after HDT, but these patients had better prognostic factors: only 60% of patients presented with an aaIPI > 1 compared with 91% in our study. Additionally, 20% of patients in the published analysis had ALCL without discrimination between ALK+ and ALK− patients. The GELA [21] presented data on a cohort of mature T-cell lymphoma patients younger than our population (median 36 years) but otherwise comparable (28 patients, no ALCL, 75% aaIPI > 1). OS and EFS for patients who had been transplanted in first CR were 49% and 45%, respectively. In contrast to our population, patients had reached CR before HD therapy. Corradini et al. [17] published long-term follow-up data on ALK− patients treated with HDT and reported 12-year OS and EFS of 21% and 18%, respectively. All prospective studies published so far show that <40% of the patients with T-cell lymphomas were cured by HDT/ASCT. Prospective randomized studies comparing HDT/ASCT with conventional chemotherapy are warranted before HDT/ASCT may be considered standard therapy for younger patients [22]. The majority of T-cell lymphoma patients fail first-line treatment and will need alternative therapy. Recently, several retrospective analyses showed promising results with allogeneic transplantation [23–25] while the efficacy of new drugs awaits further study [26, 27].

In conclusion, the results obtained with the MegaCHOEP protocol in patients with T-cell lymphoma were no better than other phase II studies using HDT/ASCT as part of first-line therapy. The foremost goal of the protocol—applying increased doses and dose intensity of active drugs as early as possible [14] to improve results by preventing early progression—was not achieved. Therefore, the DSHNHL decided to stop recruitment of T-cell lymphoma patients into the MegaCHOEP phase III trial. A phase III study which will compare classical chemotherapy followed by conventional HDT/ASCT to reduced intensity conditioning followed by allogeneic transplantation in patients with T-cell lymphoma will start shortly.

**Acknowledgements**

We like to thank the ‘Deutsche Krebshilfe’ for supporting the MegaCHOEP phase III trial and Mrs Kristina Kocksch for data management of the phase III trial and Beate Mann and Ulrike Schoenwiese for data management of the phase II trials. The following investigators and institutions are members of the German High Grade Lymphoma Study Group:

- Saarland University Medical School, Homburg, Germany—M Pfundenschuh; University Hospital, Magdeburg, Germany—M Mohren; Mannheim Hospital, Mannheim, Germany—E Lengfelder; University Hospital, Köln, Germany—M Reiser; Großhadern der LMU Hospital, München, Germany—C Nickenig; Hospital Maternity House of Borromäerinnen, Trier, Germany—MR Clemens; Carl-Thiem Hospital, Cottbus, Germany—N Peter; University Hospital Eppendorf, Hamburg, Germany—M deWit; St Josefs and St Marien Hospital, Hagen, Germany—H Eimermacher; Medical Hospital, Ruprecht-Karls University, Heidelberg Germany—A Ho; Stadt Ludwigshafen Hospital, Ludwigshafen, Germany—M Hoffmann; University Hospital, Freiburg, Germany—R Mertelsmann; AK St Georg, Hamburg, Germany—N Schmitz; Georg August University, Göttingen, Germany—L Trümper; Evangelisches Krankenhaus Hamm, Germany—L Balleisen; University Hospital, Münster, Germany—R Liersch; Städtische Hospital, Oldenburg, Germany—B Metzner; Evangelisches Diakonie-Krankenhaus, Bremen, Germany—KH Pfüger; University Hospital, Essen, Germany—U Dührsen; Städtisches Krankenhaus Martha-Maria,

---

**Table 3.** Risk factor analysis of EFS and OS*  

<table>
<thead>
<tr>
<th>Factor</th>
<th>Relative risk</th>
<th>95% Confidence interval</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-cell versus B-cell</td>
<td>2.2</td>
<td>1.4–3.5</td>
<td>0.001</td>
</tr>
<tr>
<td>ECOG &gt;1</td>
<td>1.8</td>
<td>1.2–2.8</td>
<td>0.007</td>
</tr>
<tr>
<td>Stage III/IV</td>
<td>2.2</td>
<td>1.3–3.7</td>
<td>0.006</td>
</tr>
<tr>
<td>OS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-cell versus B-cell</td>
<td>1.6</td>
<td>1.0–2.8</td>
<td>0.068</td>
</tr>
<tr>
<td>ECOG &gt;1</td>
<td>1.4</td>
<td>0.9–2.3</td>
<td>0.168</td>
</tr>
<tr>
<td>Stage III/IV</td>
<td>2.6</td>
<td>1.4–4.8</td>
<td>0.003</td>
</tr>
</tbody>
</table>

* Cox model adjusted for international prognostic index factors.  
EFS, event-free survival; OS, overall survival; ECOG, Eastern Cooperative Oncology Group.
Waldbroël, Germany—S Brettner; joint medical practice: Hahn/Hospital, Stuttgart, Germany—R Mück; Kreiskrankenhaus, Reschke/Hinrichs, Oldenburg, Germany—B Otremba; Diakonie Koblenz, Germany—HH Dormeyer; Municipal Hospital, Hochschule, Hannover, Germany—A Ganser; Municipal Brueder, Trier, Germany—C B Kölbel; Kantonsspital, CH-Baden, Germany—HG Mergenthaler; Krankenhaus der Barmherzigen Marienhospital, Hamm, Germany—H Düerk; Medizinische Krankenhaus, Halle/Saale, Germany—R Willenbrock; St Budesovice, Germany—J Fischer; Allgemeines Krankenhaus, Germany—J H Beer; Ceske Budesovice Hospital, CZ—Langer; Maerkische Hospital, Lüdenscheid, Germany—G Heil; Germany—T Gaska; Kreiskrankenhaus, Aurich, Germany—W Nickelsen et al. Volume 20 | No. 12 | December 2009

original article Annals of Oncology

1982 | Nickelsen et al.

Halle/Saale, Germany—W Schütte; St Bernward Krankenhaus, Hildesheim, Germany—U Kaiser; Städtisches Hospital, Karlsruhe, Germany—M Bentz; Katharinen Hospital, Stuttgart, Germany—HG Mergenthaler; University Hospital, Ulm, Germany—S Wessendorf; University Hospital Clinic, Bonn, Germany—T Sauerbruch; St Antonius Hospital, Eschweiler, Germany—R Fuchs; Klinikum rechts der Isar, München, Germany—C Peschel; Dr Horst-Schmidt Hospital, Wiesbaden, Germany—N Frickhofen; University Hospital Charité, Berlin, Germany—G Dülken; University Hospital Benjamin Franklin, Berlin, Germany—E Thiel; University Hospital, Rostock, Germany—M Freund; Helios Hospital, Wuppertal, Germany—A Raghavachar; Städtisches Klinikum St Georg, Leipzig, Germany—L Mantovani-Löffel er; Krankenhaus Maria-Hilf II Franziskushaus, Mönchengladbach, Germany—U Graeven; Rostock Südstadt Hospital, Rostock, Germany—B Kramer-Steiner; St Marien Hospital, Amberg, Germany—L Fischer von Weikerthal; Zentralklinikum, Augsburg, Germany—G Schlimok; Krankenhaus Nordwest Frankfurt, Frankfurt/Main, Germany—E Jager; joint medical practice: Aldaoud/Schwarzer, Leipzig, Germany—A Aldaoud; Sana Kliniken Lübeck GmbH, Krankenhaus Süd, Lübeck, Germany—S Fetscher; St Antonius Hospital, Wuppertal, Germany—M Sandmann; Rigshospitalet, DK-Kopenhagen, Germany—M Hansen; Städtische Krankenanstalten, Krefeld, Germany—T Frielings University Hospital Schleswig-Holstein, Lübeck, Germany—T Wagner; St Vincentius Hospitals, Karlsruhe, Germany—I Mezger; Altstadt Hospital, Magdeburg, Germany—E Kettner; Oncological Priority Practice, Münster, Germany—C Lerchenmüller; St Marienkrankenhaus, Siegen, Germany—T Gaska; Kreiskrankenhaus, Aurich, Germany—W Langer; Mäkische Hospital, Lüdenscheid, Germany—G Heil; University Hospital Regensburg, Regensburg, Germany—R Andreessen; Allgemeines Krankenhaus, Celle, Germany—S Hollerbach; Ernst von Bergdamm Hospital, Potsdam, Germany—G Maschmeyern; Kantonsspitale, CH-St Gallen, Germany—T Cerny; Municipal Hospital, Braunschweig, Germany—B Wörmann; Franz Hospital, Dülmen, Germany—G Dresemann; Johann-Wolfgang-Goethe University Hospital, Frankfurt/Main, Germany—L Bergmann; Municipal Hospital, Fulda, Germany—H G Höffkes; Ernst-Moritz-Arndt University, Greifswald, Germany—G Dülken; Amtsversuchsamt i her Herlev, DK-Herlev, Germany—H Johnsen; St Vincenz-Krankenhaus, Limburg, Germany—KP Schall; Bürgerhospital, Stuttgart, Germany—HG Mergenthaler; Krankenhaus der Barmherzigen Brüder, Trier, Germany—C B Köbel; Kantonsspitale, CH-Baden, Germany—J H Beer; Ceske Budesovice Hospital, CZ—Budesovice, Germany—J Fischer; Allgemeines Krankenhaus, Hagen, Germany—T Scholtlen; St Elisabeth and St Barbara Krankenhaus, Halle/Saale, Germany—R Willenbrock; St Marienhospital, Hamm, Germany—H Durk; Medizinische Hochschule, Hannover, Germany—A Ganser; Municipal Hospital, Hildesheim, Germany—F Schmitz; KMT-Klinik, Idar-Oberstein, Germany—A A Fauser; Evangelische St Martin, Koblenz, Germany—HH Dormeyer; Municipal Hospital, Netetal, Germany—M Paue; joint medical practice: Otterbeck/Reschke/Hinrichs, Oldenburg, Germany—B Otterbeck; Diakonie Hospital, Stuttgart, Germany—R Mück; Kreiskrankenhaus, Waldbröl, Germany—S Bretten; joint medical practice: Hahn/
Practice for Haematology and Oncology, Krefeld, Germany—M Neise; Onkologische Praxis am Diakonissenhaus, Leipzig, Germany—B Beyer; University Hospital, Mainz, Germany—C Huber; Practice for Internal Medicine, Naunhof, Germany—J Uhlig; Practice for Haematology and Oncology, Norderstedt, Germany—R Hofmann; Marienhospital, Osnabrück, Germany—M Müller; Practice for Haematology and Oncology, Regensburg, Germany—R Dengler; Leopoldina-Krankenhaus, Schweinfurt, Germany—S Kanzler; joint medical practice: Springer/Fiechtner, Stuttgart, Germany—G Springer; Spital Uster, Uster, Switzerland—G Tscherry; University Hospital, Zürich, Switzerland—A Knuth; Heinrich-Braun-Krankenhaus/Städt. Klinikum, Zwickau, Germany—U Kreibich; joint medical practice: Brudler/Heinrich/Bangerter, Augsburg, Germany—B Heinrich; Kreiskrankenhaus Bad Hersfeld, Bad Hersfeld, Germany—R Nowak; Helios-Klinikum Bad Saarow/Stürzelberg, Germany—U Wruck; joint medical practice: Weinert/Betinger, Bad Saalfeld, Germany—R Weinert; joint medical practice: Iblei/Blau, Berlin, Germany—I Blau; joint medical practice: Herrenberger/Kreutz/Ellrich/Kirsch, Berlin, Germany—J Herrenberger; Evangelisches Waldkrankenhaus Spandau, Berlin, Germany—E Auert; Campus Charité Mitte, Berlin, Germany—K Possinger; University Hospital Bochum, Germany—W Schmiegel; Medizinische Universitätsschule Bonn, Germany—I Schmidt-Wolf; Johanniter Krankenhaus, Bonn, Germany—Y Ko; Onkologische Schwerpunktpraxis, Borken, Germany—R Kellner; HOK, Fakultätshospital, Bonn, Germany—J Hartmann; Evangelisches Diakoniekrankenhaus, Freiburg, Germany—HP Allgäer; Klinikum Garmisch-Partenkirchen, Garmisch-Partenkirchen, Germany—H Lambert; joint medical practice: Mittermüller/Goldel, Germering—J Mittermüller; Wilhelm-Anton-Hospital, Goch—R Vunde; joint medical practice: Kollobach/Thomas, Greifswald, Germany—R Thoms; Allgemeines Krankenhaus/Rosenheim, Rosenheim, Germany—R Souchon; joint medical practice: Rohrer/Hurtz/Schmidt/Frank-Gleich, Halle/Saale, Germany—M Schmidt; AK Altona, Hamburg, Germany—D Braumann; Marienkrankenhaus, Hamburg, Germany—U Vanhoefer; Klinikum Region Hannover, Germany—R Nowak; St-Lukas-Klinik, Saarbrücken, Germany—G Jacobs; Klinikum Schwerin, Schwerin, Germany—D Schumann; Krankenhaus Maria-Hilf, Stadthalle, Germany—C Deuticke; Onkologische Solingen, Germany—KH Beckers; Krankenhaus Maria-Hilf, Stadthalle, Germany—C Deuticke; Onkologische Schwerpunktpraxis, Trier, Germany—M Lyse; Veije Sygehus, DK-Veje, O Gadeberg; Klinikum der Stadt, Villingen-Schwenningen, Germany—W Brugger; Asklepios Nordseeklinik, Westerland, Germany—W Netterkoven.

References


Annuals of Oncology


