Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Background: Chronic lymphocytic leukemia is a common adulthood leukemic type, although the incidence rate in the Kurdistan region is low. It is well known that chronic lymphocytic leukemia is prevalent among older adults; however, frequent cases of chronic lymphocytic leukemia are newly diagnosed at a younger age. **Aim of the Study:** To analyze the difference in disease presentation, progression, and outcomes between younger and older patients with chronic lymphocytic leukemia in the Kurdistan region of Iraq. **Patients and Methods:** A retrospective cross-sectional review study was carried out in three oncology centers in the Kurdistan region (Nanakaly Hospital in Erbil, Hiwa Center in Sulaymaniyah, and Azadi Center in Duhok) for 10 years, from the 1st of January, 2010, to the 31st of December, 2019, on a convenient sample of 152 patients with chronic lymphocytic leukemia. Diagnosis of chronic lymphocytic leukemia was done by oncologists in Kurdistan tumor centers according to the International Workshop on Chronic Lymphocytic Leukemia. The age of patients at diagnosis was categorized into two groups and ranged from 25 to 94 years. The age cutoff value in the current study (55 years) depended on previous literature. **Results:** The mean age of patients at diagnosis was 63 years; 28% were diagnosed at ≤50 years of age, and 72% were diagnosed at an age of more than 55 years. Older patients significantly presented with weight loss, whereas younger patients significantly presented with neck lumps. There was a highly significant association between the advanced ECOG performance scale and older age at diagnosis. A significant association was observed between the death outcome of chronic lymphocytic leukemia and older age at diagnosis. The mean survival duration of younger patients at diagnosis was significantly longer than that of patients who were older at diagnosis. **Conclusions:** Clinical presentation, physical status, death rates, and survival of patients with chronic lymphocytic leukemia in the Kurdistan region of Iraq are different between younger and older patients. **Keywords:** CLL, chronic lymphocytic leukemia, age, death, survival

CLL-045

The Dedalo Protocol: An Integrated Approach to MRD in CLL Patients Receiving Venetoclax Plus Rituximab

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Background: In previous analyses, the MURANO study demonstrated significant progression-free survival (PFS) and overall survival (OS) benefit for fixed-duration venetoclax-rituximab treatment compared with bendamustine-rituximab in relapsed/refractory chronic lymphocytic leukemia patients. Furthermore, the study demonstrated that deep responses with undetectable minimal residual disease (uMRD) were associated with favorable PFS. We designed the "Dedalo" study with the goal of testing MRD from a multidisciplinary point of view (flow cytometry, molecular biology and ultrasound) and of assessing MRD predictive/prognostic value. **Methods:** Today 17 patients have been enrolled in the protocol; most of them were characterized by IgHV mutational status and TP53/del(17p) presence. MRD status was assessed by flow cytometry in peripheral blood from 11 patients after the first cycle and in 10 patients after the sixth cycle of rituximab-venetoclax, with a sensitivity of 10^{-4}. **Results:** Out of the 17 enrolled patients, only one patient had to discontinue the treatment and 8 patients reached the twelfth month of therapy. After the first cycle, MRD status was assessed in 11 patients, with a 72.7% rate of PB undetectable MRD (less than 10^{-4}) and a 27.3% rate of low MRD positivity, and with 0% of high MRD positivity (defined as $\geq 10^{-2}$). After the sixth cycle, conversely, MRD status was assessed in 10 patients, with an 80% rate of uMRD. Among the 5 patients carrying del(17p) or TP53 mutation, 3 patients reached uMRD after the first cycle, 1 patient has achieved a low MRD positivity after the first cycle, and 1 patient remained MRD positive after the eighteenth cycle. **Conclusions:** With all patients still on treatment, favorable MRD kinetics was observed in the venetoclax-rituximab setting. The majority of patients achieved PB uMRD after the first cycle of the treatment, with a higher percentage after the sixth cycle. These results are superimposable to those from MURANO trial (at 4 months, uMRD 60%, low MRD positivity 20%, 78% at 6 months). The durability of uMRD rates, their role in the prediction of PFS in a real-life experience, and the effect of genetic characteristics on the MRD kinetics are still under investigation. **Keywords:** CLL, chronic lymphocytic leukemia, MURANO, MRD, venetoclax, rituximab

CLL-050

Induction of Neutralizing Antibodies in Chronic Lymphocytic Leukemia Patients After SARS-CoV-2 mRNA Vaccination: A Monocentric Experience

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Background: SARS-CoV-2 infection increases the clinical risk and mortality of patients with chronic lymphocytic leukemia (CLL). Covid-19 vaccinations have the potential to protect individuals from severe infection, but little is known about the antibody response profile in these patients after vaccination. We compared the anti-receptor binding domain (RBD) and neutralizing antibody responses of 27 patients with CLL to those of healthy donors after mRNA Covid-19 vaccination. **Methods:** Of the 27 patients

enrolled in the study, 21 received the BNT162b2 mRNA vaccine and 6 received the Spikevax mRNA vaccine. Four patients were in clinical remission after treatment, 10 were treatment-naïve, and 13 were under treatment at the time of vaccination. Blood samples were taken before vaccination and after the second dose, with a median time between of 23 days. The levels of anti-RBD IgG, IgM, and IgA were evaluated by ELISA on recombinant RBD; the neutralizing antibody response was evaluated by spike protein inhibition assay (SPIA). We also performed a fluorescence-activated cell sorting study of peripheral blood mononuclear cell subpopulations, a disease burden assessment using blood indicators (lactate dehydrogenase, beta-2-microglobulin, lymphocytic count) and imaging, and an evaluation of IgG levels at the time of vaccination. **Results:** A comparison of anti-RBD antibody seroconversion (IgG, IgM, and IgA) and neutralizing antibodies present after vaccination between 27 patients with CLL and healthy control subjects indicated that CLL patients had a considerably lower response rate (50% vs. 100%) and lower antibody levels than the healthy controls. We found an inverse correlation between the spleen dimension and lymphonodal area. By stratifying patients according to the presence of neutralizing antibodies after vaccination, we found a larger prevalence of SPIA positives than SPIA negatives in treatment-naïve patients (60%); however, patients undergoing treatment had a much lower percentage of SPIA positives (23.1%). **Conclusions:** Only around half of vaccinated CLL patients acquire detectable anti-RBD and neutralizing antibodies, according to our findings. Furthermore, we discovered a substantial difference in the rates of detectable anti-SARS-CoV-2 antibodies between patients who were treatment-naïve/in clinical remission and those on CLL-directed treatment. The persistence and burden of disease represent a surrogate of vaccine failure, probably due to the persistence of immune dysfunction. **Keywords:** CLL, chronic lymphocytic leukemia, COVID-19, mRNA vaccination, antibody response, disease burden

CLL-069

Diagnosis and Management of Infectious Complications in Chronic Lymphocytic Leukemia

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Context: Chronic lymphocytic leukemia (CLL) is an actual issue of oncology due to the increase of morbidity, frequent and therapy-resistant relapses, the development of infectious complications, commonly leading to the unfavorable prognosis. **Objective:** The identification of diagnostic features and management outcomes of infectious complications in CLL. **Design:** We realized the case-control study of 82 CLL patients, who were treated at the Institute of Oncology in Moldova between 2000–2021. The diagnosis was proved according to the IWCLL criteria based on the complete blood count with the detection of lymphocytosis ≥ $5x10^9$/l, bone marrow aspiration with lymphocytic infiltration ≥30% and immunophenotyping. **Setting:** The study was related to the out-patient and hospitalized care. **Participants:** The study included CLL patients of 45–86 years old (median age 66.2 years). There were 47 men (57.3%) and 35 women (42.7%). **Interventions:** According to the Binet Classification, 54 (65.9%) patients were placed in stage A and 28 (34.1%) in stage B. **Main Outcome Measures:** The overall survival (OS) estimated the long-term results. **Results:** The study of the age structure revealed the predominance of patients of 60–79 years old. Twenty-two (40.8%) stage A patients experienced the CLL transformation into stage B. Transformation into stage C was observed in 10 (35.7%) patients. The respiratory bacterial infections turned out to be frequently diagnosed (29 patients, or 80.6%): acute pneumonia in 10 (27.8%), acute bronchitis in 7 (19.4%), relapse of chronic bronchitis in 11 (30.6%), and tuberculosis in 1 (2.8%) patient. Viral herpetic complications were diagnosed in 2 (5.6%) cases. Infectious complications of the other systems were detected in 5 (13.8%) patients: nephro-urinary infections in 3 (8.2%) and acute otitis in 2 (5.6%). Death occurred over a period of 3–19 years in 16 (19.5%) patients, due to infectious complications in 6 (37.5%), as a result of CLL progression in 5 (31.3%), due to the secondary tumors in 4 (25.0%), and acute cerebrovascular accident in 1 (6.2%). The 3- and 5-year OS was 100% and 95.7% in patients with stage A and 84.8% and 55.4% in stage B. **Conclusions:** Infectious complications are frequent manifestations and cause of death in CLL, especially in stage B. **Keywords:** CLL, chronic lymphocytic leukemia, infectious complications, stage, survival

CLL-093

Long-Term Survival After Fludarabine, Cyclophosphamide, and Rituximab Treatment in Previously Untreated Chronic Lymphocytic Leukemia Patients

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Background: Chronic lymphocytic leukemia (CLL) is characterized by a lower incidence rate in Iraq and Kurdistan as compared to Western countries. However, a good prognosis of CLL is dependent on diagnosis, risk stratification, and a better choice of an appropriate treatment regimen. **Aim of the Study:** To evaluate the effectiveness of fludarabine, cyclophosphamide, and rituximab (FCR) regimen in comparison to other chemotherapy regimens in the management of patients with CLL in the Kurdistan region of Iraq. **Patients and Methods:** A retrospective review study was carried out in three cancer centers in the Kurdistan region of Iraq for a duration of 10 years from January 1, 2010, to December 31, 2019, on 152