Clinical Benefits of Epoetin Alfa (Eprex) 10,000 Units Subcutaneously Thrice Weekly in Thai Cancer Patients with Anemia Receiving Chemotherapy

Narin Voravud, MD*,
Virote Sriuranpong, MD*

** Department of Medicine, Faculty of Medicine, Chulalongkorn University*

Background: *Recently the American society of clinical oncology and the American society of hematology have jointly launched the clinical practice guideline of epoetin usage in cancer related anemia patients. The recommended starting dose is 150-300 unit/kg thrice weekly. The clinical outcome of epoetin alfa 10,000 units subcutaneously thrice weekly regimen has not been evaluated in Thai cancer patients with anemia yet.*
Objectives: *To determine the clinical benefits and safety of epoetin alfa (Eprex) 10,000 units subcutaneously thrice weekly in anemic cancer patients receiving chemotherapy.*
Patients: *The present study was an open label, non-randomized study. Adult patients were eligible for inclusion aged $\geq$ 18 years with a confirmed diagnosis of non-myeloid malignancy in the upper area of the body and scheduled to receive chemotherapy regardless of the concurrent radiotherapy. All patients had hemoglobin (Hb) level less than 11 g/dL, serum ferritin more than 100 ng/dL and had a life expectancy of at least 6 months.*
Material and Method: *All patients were initially treated with Epoetin alfa 10,000 units subcutaneously thrice weekly. The dose was up to 20,000 units after 4 weeks of therapy, if Hb level did not increase by > 1.0 g/dL. Treatment time was 16 weeks. Target Hb was 12 g/dL Blood transfusion and iron supplement was permitted.*
Efficacy Assessments: *The primary efficacy end point was the proportion of responders (patients with an increase in Hb $\geq$ 1 g/dL). Secondary efficacy evaluation was change in Quality of life (QOL) scores by the Linear Analog Scale Assessment (LASA) and Quality of life-Chula (QOL-CU) scale. Statistical Analysis was t-tests, P< 0.05 was considered significant.*
Results: *Forty patients (21 men and 19 women) were enrolled. Twenty five patients (62.5%) had stage of disease in grade III or IV. The mean Hb levels at baseline were 8.46 $\pm$ 1.28 g/dL. Eight patients (20%) refused to complete the course during the study. Reasons for refusing to participate included lack of time, changing the resident area or disease progression. Twenty three of 32 patients (71.8%) were responders. These patients completed the study course and showed good response. Their mean Hb levels increased gradually and reach approximately 11g/dl by week 4 and were maintained through week 16. The significant difference in mean Hb level of baseline was initially found at week 4 of the study (10.26 $\pm$ 1.95 g/dl; p = 0.001 vs baseline). The LASA score increased in all of three items including level of energy, ability to do daily activities, and overall QOL but not statistical significance. However, the improvement of quality of life of cancer patients, evaluated by QOL-CU, was significantly apparent after treatment, (p < 0.05). The most common adverse events were grade I flu like symptoms (17.5%) and recovered the next day.*
Conclusion: *Epoetin alfa (Eprex) 10,000 units thrice weekly significantly increased the hemoglobin levels, achieving the target hemoglobin and sustained the level in cancer patients with anemia receiving chemotherapy. Clinical benefits on functional status and quality of life were also improved. The treatment was well tolerated.*

Keywords: *Epoetin, Cancer, Anemia*

J Med Assoc Thai 2005; 88(5): 607-12
Full text. e-Journal: *http://www.medassocthai.org/journal*

Correspondence to : Voravud N, Medical Oncology Unit, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Anemia secondary to a diagnosis of cancer, or resulting from its treatment, is an important clinical problem for which new anti-cancer have recently become available[1,2]. The development of anemia is characteristically a delayed complication of treatment. Transfusion was the conventional therapy for symptomatic anemia. Growing concern about infectious risks has led to decreased usage of transfusions. Also the realization that blood products represent a limited resource leading to strategies to optimize their use.

Epoetin alfa is recombinant human erythropoietin, the hematologic growth factor that regulates the proliferatation, maturation, and differentiation of RBCs[3-5]. Epoetin alfa has been shown in clinical trials to correct or prevent anemia and to decrease the need for blood transfusions[6-8]. Miller et al demonstrated the response of erythropoetin in the cancer related anemia were lower than iron deficiency anemia[9]. The anemia of chronic disease is considered to be one of the causes in cancer related anemia. The inflammatory cytokines may directly suppress erythropoiesis and also inhibit erythropoietin production[10]. With all data, the epoetin dosage in cancer related anemia should be higher than other types of anemia. Two recent studies[9,10] were conducted in a total of over 1000 community-based oncology practices to measure clinically relevant outcomes, including quality of life evaluations (eg., energy level, activity level, and overall well-being using visual analog scales), hemoglobin changes, and transfusion requirements. Over 4,300 anemic cancer chemotherapy patients (2,030 - Study I; 2,289 - Study II) with various tumor types were treated with a starting dose of 10,000 Units of Epoetin alfa subcutaneously three times weekly, which could be doubled if response was not satisfactory. In study I, 23% of patients and in study II, 22% of treated patients had hematological malignancies, including; lymphoma, multiple myeloma, Hodgkin's disease, and chronic lympholytic leukemia. The remainder had solid tumors including (Study I/Study II); lung cancer (22%/24%), breast cancer (18%/17%), gynecological malignancies (14%/13%), gastro-intestinal malignancies (6%/9%), prostate cancer (4%/3%), head and neck tumors (2%/2%), bladder cancer (2%/2%), and pancreatic, esophageal and renal cancers (1% each both studies), others (4%/5%) and unknown (1%/1%). In both studies, energy level, activity level, and overall quality of life improved significantly ($p \leq 0.001$) over baseline levels. In addition, these quality of life improvements correlated directly with hemoglobin change from baseline. As hemoglobin increased with Epoetin alfa treatment, quality of life parameters improved significantly. It is important to note that where there was no increase in hemoglobin, there was no improvement in energy level, activity level, and overall quality of life.

Recently the American society of clinical oncology and the American society of hematology have jointly launched the clinical practice guideline of epoetin usage in cancer related anemia patients[11]. The recommendations are based on evidence from trials in which epoetin was administered subcutaneously thrice weekly. The recommended starting dose is 150 unit/kg thrice weekly for a minimum of 4 weeks, with consideration given for dose escalation to 300 unit/kg thrice weekly for an additional 4-8 weeks in those who do not respond to the initial dose. However epoetin alfa has been marketed in Thailand since 1990. The clinical outcome of epoetin alfa 10,000 units SC thrice weekly regimen has not been evaluated in Thai cancer patients with anemia yet. So the present study was designed to evaluate the efficacy and safety of epeotin alfa in the management of cancer related anemia.

Objective

To determine clinical benefits and safety of epoetin alfa (Eprex) 10,000 units subcutaneously thrice weekly in anemic cancer patients receiving chemotherapy.

Material and Method

Patients

The present study was an open label, non-randomized study. Adult patients were eligible for inclusion aged $\geq$ 18 years with a confirmed diagnosis of non-myeloid malignancy in the upper area of the body and scheduled to receive chemotherapy with or without concurrent radiotherapy. All patients had a hemoglobin level less than 11 g/dL, serum ferritin more than 100 ng/dL and had a life expectancy of at least 6 months. None of the patients had secondary metastases (other than nodal disease), poorly controlled hypertension, defined as diastolic blood pressure persistently greater than 100 mmHg, hypersensitivity to Epoetin alfa or mammalian cell-derived products, pregnancy or lactation, history of seizure, anemia due to other factors (i.e., iron or folate deficiencies, hemolysis, gastrointestinal bleeding, or any active bleeding), presence of chronic inflammatory conditions (e.g. rheumatoid arthritis) or infectious disease which might impair responsiveness to erythropoietin, acute major

illness within 7 days of study entry, or major infection within 28 days of study entry. A consent form was signed at the study entry.

Method

Patients suitable for inclusion were initially treated with Epoetin alfa (Eprex) 10,000 units administered subcutaneously once weekly. If, after 4 weeks of therapy, the hemoglobin level did not increase by > 1.0 g/dL, the dose of Epoetin alfa was to be increased to 20,000 units subcutaneously once weekly at week 5. The Epoetin alfa treatment was continued for a total of 16 weeks. However, if the hemoglobin raised above 13 g/dL, Epoetin alfa therapy should be withheld until the hemoglobin level decreased to less than 12 g/dL and then reinstated at 75% of the original dose. The dose of Epoetin alfa should also be reduced if there was an increase of hemoglobin of > 13 g/dL in a 2-week period. Blood transfusion was permitted during the study at the discretion of the physician but was to be avoided in patients with a hemoglobin level greater than 8 g/dL unless clinically indicated. An oral daily dose of 325 mg of ferrous sulfate administered three times a day was recommended to avoid depletion of iron stores and to adequately support erythropoiesis by Epoetin alfa.

Efficacy assessments

The primary efficacy end point was the proportion of responders (patients with an increase in hemoglobin level from baseline to last value $\geq$ 1 g/dL). Hemoglobin concentration evaluations were performed at screening and every 4 weeks after starting the study. Secondary efficacy evaluation was the change in QOL scores from baseline to last value. QOL was measured using a patient-completed QOL battery consisting of the Linear Analog Scale Assessment (LASA) and Quality of life - Chula (QOL-CU) scale. The QOL-CU is a 20-item questionnaire measured anemia symptoms, 13 of which assess fatigue symptoms and 7 of which assess nonfatigue-related symptoms. The score of QOL-CU contains 5 grade (0,1,2,3,4) by 0 as the best and 4 as the worst QOL. The LASA consists of three linear analog scales, each 100 mm long, that measure level of energy, the ability to do daily activities, and overall QOL related to cancer symptoms. Subjective QOL assessments were completed before the start of the study, at weeks 4,8,12 and 16 after treatment with Epoetin alfa. Patients scored their own perceptions of these domains by placing a mark along the line, with 0 as the worst and 100 as the best QOL. The QOL-CU and LASA scales are cancer-specific and have demonstrated sensitivity to hemoglobin. Therefore, the two scales were considered particularly suitable for detecting any change in QOL due to administration of Epoetin alfa and subsequent increase in hemoglobin.

Statistical analysis

Change in hemoglobin level and QOL score from baseline to value every four weeks through the course of study were compared by t-tests, and the proportions of responders (patients with an increase in hemoglobin $\geq$ 1 g/dL) were observed. Pearson correlation coefficients were calculated to assess the relationship between hemoglobin level and QOL scores. For all statistical analyses, $p < 0.05$ was considered significant.

Results

There were a total of 40 patients (21 men and 19 women). These patients were resolved from anemia with Epoetin alfa treatment for 16 weeks. All demographics and baseline clinical characteristics of patients are illustrated in Table 1. Most patients had advanced disease, and 25 patients (62.5%) had the disease in

Table 1. Demographic and Baseline Clinical Characteristics

Characteristic	Epoetin alfa (n = 40)	
	N	%
Gender		
Male	21	52.0
Female	19	48.0
Age, years	55.65±11.26	
Mean ± SD		
Stage of disease		
I	0	0.0
II	15	37.5
III	10	25.0
IV	15	37.5
Cancer type		
Lung	24	60.0
Colon	6	15.0
Nasopharynx	4	10.0
Liver	1	2.5
Pancreas	1	2.5
Other	4	10.0
Chemotherapy regimen		
Cisplatin regimen	20	50.0
Non-cisplatin regimen	20	50.0
Hemoglobin,g/dl, mean ± SD	8.46±1.28	
Range	5.7-11.5	
Median	8.6	

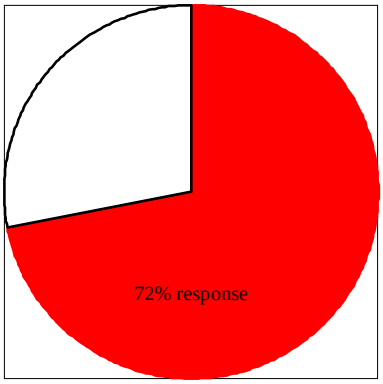

Fig. 1 Response rate of Epoetin alfa 10,000 U TIW

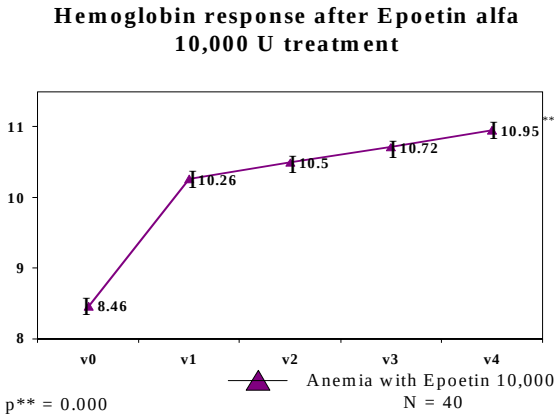

Fig. 2 Hemoglobin response after epoetin alfa 10,000 U TIW

grade III or IV. The mean hemoglobin levels at baseline were 8.46 ± 1.28 g/dL.

Proportion of responder

From a total of 40 patients, eight patients (20%) refused to participate. Their reasons were lacking of time, changing the resident area or disease progression. At the end of the present study, the proportions of responder were 23 of 32 patients (71.87%) as illustrated in Fig. 1. These patients completed the course of the study (16 weeks) and showed a good response (patients who achieved a ≥ 1 g/dL increase in hemoglobin level) after receiving Epoetin alfa.

Hematopoietic response

Mean hemoglobin values over the 16 weeks of all cancer patients with anemia treated by Epoetin alfa are shown in Fig. 2. Their mean hemoglobin levels increased gradually from week 1 to reach approximately 11g/dl by week 4 and were maintained at this level through week 16. The significant difference in mean hemoglobin level of baseline was initially found at week 4 of the study (10.26 ± 1.95 g/dl; p = 0.001 vs baseline).

QOL

The LASA and QOL-CU questionnaires were applied in the study at baseline, 4, 8, 12 and 16 weeks after starting treatment with Epoetin alfa. Baseline scores for the LASA and QOL-CU were compared every four weeks in order to evaluate the improvement of quality of life. For the LASA scale, the score increased in all of three items including level of energy, ability to do daily activities, and overall QOL but not statistical significance (Fig. 3). However, the improvement of quality of life of cancer patients, evaluated by QOL-CU, was significantly apparent after treatment, ($p < 0.05$ Unpaired t-test) (Fig. 4).

Safety

Treatment with Epoetin alfa was well tolerated. The most common adverse events were grade I flu like symptoms (17.5%) and recovered the next day.

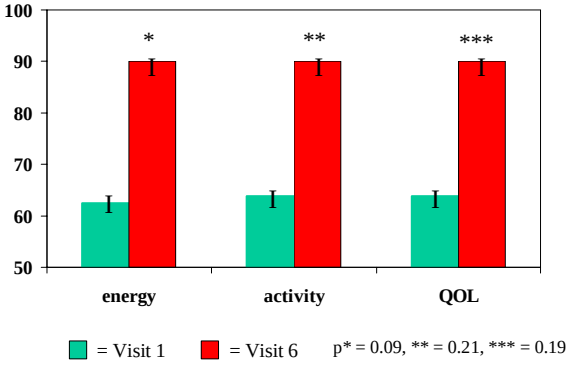

Fig. 3 Improvement of Quality of life (LASA scale) in all domains with epoetin alfa 10,000 U TIW

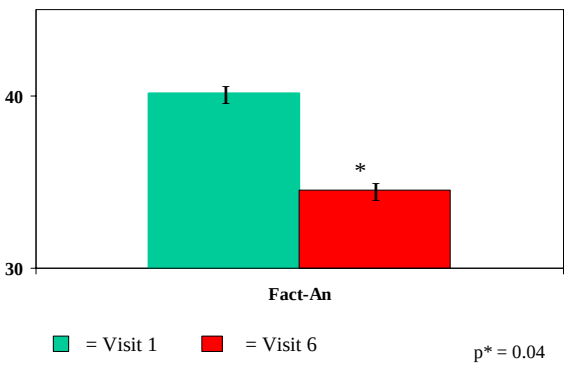

Fig. 4 Improvement of Quality of life (QOL-CU scale) with epoetin alfa 10,000 U TIW

Discussion

Over the last decade, the results of numerous placebo controlled and open-label clinical studies have demonstrated the efficacy and safety of epoetin alfa for the treatment of anemia in patients undergoing platinum- or nonplatinum-based chemotherapy[12-14]. Results were consistent across studies: epoetin alfa significantly increased hemoglobin level and decreased the incidence of blood transfusions. In studies that assessed QOL, the increase in hemoglobin level was associated with improved energy level, ability to do daily activities, and overall QOL.

In the present study, administration epoetin alfa to cancer patients with anemia receiving chemotherapy resulted in a significantly greater increase in hemoglobin level ($p < 0.05$). That replicated the results of all international well designed studies.

The 71.87% response rate of epoetin alfa regimen at 10,000 units subcutaneously thrice weekly was well accepted and comparable with the other[12]. The response rate of Littlewood trial was 66% in the Epoetin alfa group and only 17% in the placebo group.

Even all QOL data including LASA and QOL-CU, showed the positive trend but significant in only Fact-An. It probably resulted from only a few numbers of complete questionnaires which were analyzed at the time of preparing the present manuscript.

Conclusion

Epoetin alfa significantly increased in hemoglobin levels in cancer patients with anemia receiving chemotherapy. Clinical benefits on functional status and quality of life in these patients were observed. Based on the results of the present study, thrice weekly epoetin alfa 10,000 units was effective in achieving the target hemoglobin level. The treatment was well tolerated with only mild flu-like symptoms.

Reference

1. Skillings JR, Sridhar FG, Wong C, Paddock L. The frequency of red cell transfusion for anemia in patients receiving chemotherapy. Am J Clin Oncol 1993; 16: 22-5.
2. Dalton JD, Bailey NP, Barrett-Lee PJ, O'Brien MER. Multicenter UK audit of anemia in patients receiving chemotherapy. Proc Am Soc Clin Oncol 1998; 17: 418a, (Abstr 1611).
3. Winningham ML, Nail LM, Barton Burke M, Brophy L, Cimprich B, Jones L, et al. Fatigue and the cancer experience: the state of the knowledge. Oncol Nurs Forum 1994; 21: 23-36.
4. Cella D. Factors influencing quality of life in cancer patients: anemia and fatigue. Semin Oncol 1998; 25(Suppl 7): 43-6.
5. Ludwig H, Fritz E. Anemia in cancer patients. Semin Oncol 1998; 25(Suppl 7): 2-6.
6. Ludwig H, Fritz E, Kotzmann H, Hocker P, Gisslinger H, Barnas U. Erythropoietin treatment of anemia associated with multiple myeloma. N Engl J Med 1990; 322: 1693-9.
7. Abel RI. Recombinant human erythropoietin in the treatment of the anemia of cancer. Acta Haematol 1992; 87(Suppl 1): 4-11.
8. Abels R. Erythropoietin for anemia in cancer patients Eur J Cancer 1993; 29A(Suppl 2): S2-8.
9. Miller CB, Jones RJ, Piantadosi S, Abeloff MD, Spivak JL. Decreased erythropoietin response in patients with the anemia of cancer. N Engl J Med 1990; 322: 1689-92.
10. Henry D. Supplemental iron: a key to optimizing the response of cancer related anemia to rHuEPO? Oncologist 1998; 3: 275-8.
11. Demetri GD, Kris M, Wade J, Degos L, Cella D. Quality of life benefit in chemotherapy patients treated with epoetin alfa is independent of disease response or tumor type: results from a prospective community oncology study. Procrit Study Group. J Clin Oncol 1998; 16: 3412-25.
12. Glaspy J, Bukowski R, Steinberg D, Taylor C, Tchekmedyian S, Vadhan-Raj S. Impact of therapy with epoetin alfa on clinical outcomes in patients with nonmyeloid malignancies during cancer chemotherapy in community oncology practice. Procrit Study Group. J Clin Oncol 1997; 15: 1218-34.
13. Rizzo JD, Lichtin AE, Woolf SH, Seidenfeld J, Bennett CL, Cella D, et al. Use of epoetin in patients with cancer: evidence-based clinical practice guideline of the American Society of Clinical Oncology and the American Society of Hematology. J Clin Oncol 2002; 20: 4083-107.
14. Littlewood TJ, Bajetta E, Nortier JWR, Vercammen E, Rapoport B. Effect of epoetin alfa on hematologic parameters and quality of life in cancer patients receiving nonplatinum chemotherapy: results of a randomized, double-blind, placebo-controlled trial. J Clin Oncol 2001; 19: 2865-74.
15. Cascinu S, Fedeli A, Del Ferro E, Luzi Fedeli S, Catalano G. Recombinant human erythropoietin treatment in cispatin-associated anemia: a randomized, double-blind trial with placebo. J Clin Oncol 1994; 12: 1058-62.
16. Kurz C, Marth C, Windbichler G, Lahousen M, Medl M, Vavra N, et al. Erythropoietin treatment under polychemotherapy in patients with gynecologic malignancies: a prospective, randomized double-blind placebo-controlled multicenter study. Gynecol Oncol 1997; 65: 461-6.

การศึกษาประสิทธิผลทางคลินิกของ ยา อีโพอีติน อัลฟา (อีเพร็กซ์) ฉีดใต้ผิวหนังครั้งละ 10,000 ยูนิต สัปดาห์ละ 3 ครั้ง ในผู้ป่วยมะเร็งที่มีภาวะโลหิตจาง เนื่องจากการรับเคมีบำบัด

นรินทร์ วรวุฒิ, วิโรจน์ ศรีอุฬารพงษ์

ความเป็นมา: เนื่องจากสมาคมแพทย์อเมริกันสาขามะเร็งวิทยาคลินิก และสมาคมแพทย์อเมริกัน สาขาโลหิตวิทยา ร่วมกันจัดทำคำแนะนำการใช้ อีโพอีติน ในผู้ป่วยมะเร็งที่มีภาวะโลหิตจาง คือฉีดครั้งละ 150-300 ยูนิต/กิโลกรัม สัปดาห์ละ 3 ครั้ง ผลทางคลินิกของการใช้ อีโพอีติน อัลฟาครั้งละ 10,000 ยูนิต สัปดาห์ละ 3 ครั้ง ยังไม่มีการศึกษาในผู้ป่วยมะเร็งที่มีภาวะโลหิตจางของประเทศไทยมาก่อน

วัตถุประสงค์: ศึกษาผลทางคลีนิกและความปลอดภัยของการใช้ อีโพอีติน อัลฟา (อีเพร็กซ์) ครั้งละ 10,000 ยูนิต ทางผิวหนัง สัปดาห์ละ 3 ครั้ง ในผู้ป่วยมะเร็งที่มีภาวะโลหิตจางและกำลังได้รับยาเคมีบำบัดร่วมด้วย

รูปแบบการศึกษา: การศึกษาแบบเปิดชนิดไม่สุ่มตัวอย่าง โดยผู้ป่วยอายุมากกว่า 18 ปี และเป็นมะเร็งที่ไม่ใช่ myeloid ในส่วนบนของร่างกาย รวมทั้งมีการรับการรักษาโดยเคมีบำบัด ซึ่งอาจจะได้รับรับการฉายรังสี ในผู้ป่วยทั้งหมดต้องมีระดับ ฮีโมโกลบิน อย่างน้อย 11 g/dL, serum ferritin มากกว่า 100 mg/dL และคาดว่ามีชีวิตอยู่เกิน 6 เดือน ผู้ป่วยเริ่มการรักษาด้วย อีโพอีติน อัลฟา (อีเพร็กซ์) ครั้งละ 10,000 ยูนิต ฉีดทางผิวหนัง สัปดาห์ละ 3 ครั้ง นาน 4 สัปดาห์ ถ้าระดับ ฮีโมโกลบินเพิ่มน้อยกว่า 1.0 g/dL ให้เพิ่มยาเป็น 20,000 ยูนิต โดยระยะเวลาการรักษาทั้งหมดนาน 16 สัปดาห์ และค่าเป้าหมาย ฮีโมโกลบิน คือ 12 g/dL และในระหว่างการรักษาอาจเสริมด้วยธาตุเหล็กได้

การประเมินผล: การวัดประสิทธิภาพปฐมภูมิในเบื้องต้น คือ อัตราส่วนของผู้ป่วยที่ตอบสนองต่อยา (ผู้ป่วยต้องมีค่าฮีโมโกลบินเพิ่ม $\geq$ 1 g/dL) ส่วนการประเมินประสิทธิภาพทุติยภูมิ ดูค่าเปลี่ยนแปลงของคะแนน คุณภาพชีวิต วัดโดยใช้ Linear Analog Scale Assessment (LASA) และแบบประเมินคุณภาพชีวิต quality of life - Chula (QOL-CU) การวิเคราะห์ทางสถิติทำโดย t-tests โดยค่า $p < 0.05$ จึงถือว่ามีผลแตกต่างอย่างมีนัยสำคัญ

ผลการศึกษา: ผู้ป่วยทั้งหมด 40 คน (ผู้ชาย 21 คน และผู้หญิง 19 คน) โดยรับการรักษา ผู้ป่วย 25 คน (62.5%) มีการดำเนินของโรคใน Grade III หรือ IV ค่าเฉลี่ยฮีโมโกลบิน ก่อนการรักษา คือ 8.46 $\pm$ 1.28 g/dL มีผู้ป่วย 8 คน ที่ออกจากการศึกษาเนื่องจากขาดเวลาในการเข้ารับการศึกษา, เปลี่ยนแปลงที่อยู่ใหม่ หรือมีการดำเนินของโรคเพิ่มขึ้น อัตราส่วนระหว่างผู้ที่ตอบสนองต่อการรักษา คือ 23 คนจากทั้งหมด 32 คน (71.87%) ผู้ป่วยร่วมการศึกษาจนครบโครงการและมีการตอบสนองที่ดีต่อ อีโพอีติน อัลฟา ระดับค่าเฉลี่ยของฮีโมโกลบินจะค่อย ๆ เพิ่มจนถึง 11 g/dL ในสัปดาห์ที่ 4 และรักษาคงระดับไว้จนถึงสัปดาห์ที่ 16 ค่าเฉลี่ยของ ฮีโมโกลบินที่ 4 สัปดาห์เพิ่มขึ้นมากกว่าค่าก่อนการศึกษา อย่างมีนัยสำคัญทางสถิติ (10.26 $\pm$ 1.95 g/dl; $p = 0.001$) คุณภาพชีวิตจาก LASA จะเพิ่มขึ้นในทุกหัวข้อ ได้แก่ level of energy, ความสามารถในการดำเนินกิจกรรมในแต่ละวันประจำวัน และ QOL แต่ไม่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ และเมื่อประเมินด้วย QOL-CU พบว่าคุณภาพชีวิตดีขึ้นอย่างมีนัยสำคัญทางสถิติ ($p < 0.05$) อาการข้างเคียงที่พบมากที่สุด คือ grade I flu like (17.5%) และสามารถหายได้ในวันถัดไป

สรุป: อีโพอีติน อัลฟา (อีเพร็กซ)ครั้งละ 10,000 ยูนิตสัปดาห์ละ 3 ครั้ง สามารถเพิ่มค่า ฮีโมโกลบิน จนถึงระดับเป้าหมายและรักษาระดับไว้ได้ ในผู้ป่วยมะเร็งที่มีภาวะโลหิตจางที่กำลังได้รับยาเคมีบำบัด และช่วยให้ผู้ป่วยมีคุณภาพชีวิตดีขึ้น อาการข้างเคียงอยู่ในเกณฑ์น้อยและยอมรับได้