# The assessment of gingival changes in children with acute Lymphoblast leukemia before and after chemotherapy - clinical study-

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## Abstract

**Background**: The aim of this study was to asses the gingival changes in children with Acute Lymphoplastic Leukemia (ALL) before and after treatment.

**Material and method:** The sample consist of (15) children with ALL (the age range was 7-13 years with an average of 10 years of age). They were newly diagnosed.
The patients were examined three times: 1st visit , before starting with chemotherapy (day 0) , $2^{nd}$ visit , after  15 days from using chemotherapy (day 15) , $3^{rd}$ visit after 30 days from using chemotherapy ( day 30 ) .
The examination included clinical parameters namely plaque index (PL.I),gingival index (G.I), assessment of gingival enlargement , collection of gingival cervicular fluid (G.C.F) , bleeding point index and Hematological parameters namely : white blood cells count (WBC count),platelets count and hemoglobin level in blood (HB).

**Result:**  There was significant difference (decrease) occurred in G I and point index ( $p < 0.05$ ) in day 30 in compare  to day 0. The intimate correlation of clinical parameter correlation of clinical parameter (C P) in day 0 was with systemic factor while in day 30, was with local factor (plaque)

**Conclusion:** There was a significant improvement in gingival health status in day 30 compared to day 0 , the intimate correlation of ( CP ) in day 0 was with systemic factor but in day 30 was with local factor with less extend to systemic factor.

**Key word: Acute Lymphoplastic Leukemia children, chemotherapy treatment, clinical parameters**

## Introduction

Acute leukemia is a clonal (that is derived from single cell malignant disorder) affecting all age groups from infancy to old age. It is characterized by the a cumulating of abnormal white blood cells in the bone marrow which replace normal marrow tissue, including haemopoietic precursor cell. This results in bone marrow failure and peripheral blood involvement. Infiltration of various organs is also a feature of some form of leukemia. [1-3]

Oral and periodontal manifestations of acute leukemia consist of leukemia infiltration, bleeding, oral ulceration and infection. Leukemia cell which can infiltrate the gingiva often result in leukemia gingival enlargement [4-6] .

The gingival enlargement in Acute leukemia ( AL ) is either due to secondary inflammatory by leukemia cells or as a consequence to secondary inflammatory response due to local irritation of preexisting periodontal

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disease [7-9] .

Immunosuppressive chemotherapy and bone marrow transplantation have been increasingly used to treat and in some cases cure numerous malignant condition [10] . The systemic squeal as a result of these immune suppressive techniques include many oral and dental complication e.g., bleeding [4] and periodontal problem may progress [11].

The oral health status of hospitalized children suffering from leukemia or other cancers is generally poor [12]. They should be considered as high risk patients for oral complication, a station which requires both suitable dentist and medical teams [13,14]. However in some cases patients undergoing cytotoxic chemotherapy and radiating therapy after experience several oral complications during and after treatment despite the supervised oral hygiene and conventional antimicrobial regimens [15].

Improvement in oral hygiene and decrease in the incidence of mucositis and oral condidiasis when received palliative treatment [16] . Also gingival enlargement resolves completely or at least partly with effective leukemia chemotherapy [17].

## Materials and methods

In the beginning of the study it was consist of 33 children with AL., they were attending the central teaching hospital for children in Baghdad department of hematology; they are newly diagnosed and did not receive chemotherapy before. Fifteen children ( 6 females + 9 males ) whose age range was 7-13 with an .average of 10 years   , were included in this study because they achieved remission of induction treatment The other 18 patient were excluded because they didn't achieve remission of induction

treatment because of high mortality rate and discontinuity of treatment .

Clinical examination was performed by the same examiner. It was done three times for ALL patients as following:

1- The first clinical examination was carried out before starting chemotherapy (day 0)
2- The $2^{nd}$ examination was carried out after 15 days from the date of starting with chemotherapy (day 15)
3- The third clinical examination was carried out when remission stage of induction was achieved. It was suggested to be after 30 days from the date of starting with chemotherapy.

The clinical parameters included plaque index (PL.I) [18], Gingival index (G.I) [19], Bleeding point index [20] ,Gingival fluid flow (G. F. F.) [21] and assessment at gingival enlargement by the method described by Seymour et al (1985)[22] with modification. The modification was done because we could not perform an alginate impression for leukemia patient. Fig -1- and Fig -2- The Laboratory examination included complete blood pasture was performed for all children of two groups to count white blood cell (x $10^9$ / L) , platelets (x $10^9$ / L) and hemoglobin level (HB) ( gm / DL ) .

## Results

Table -1- clarified the mean and SD of all parameters for the three visits of the study group. It demonstrated that the PL.I in the Ist visit was 0. 846 and it declined in $2^{nd}$ visit and then it was increased to 0.998 in 3rd visit. The mean in GI in the Ist visit was 0.545; also it declined in $2^{nd}$ visit and then increased in the 3rd visit to reach 0.386.

The gingival enlargement in the Ist visit was 0.447 and it was increased in

the $2^{nd}$ visit to 0.512 and then declined to 0.210 in the 3rd visit.

The mean of G. C. F. in the first visit was 1.47 and 1.431 in $2^{nd}$ visit while in the 3rd visit it increased to 1.956. For hematological parameter the WBC count was $2.81 \times 10^9$ / L. in Ist visit and increased in the 3rd visit to $6.20 \times 10^9$ / L. also the platelets count and Hb level in the Ist visit was $61.46 \times 10^9$ / L and 8.626 respectively and continue to increase to reach $211.3 \times 10^9$ / L and 10.646 in 3ed visit respectively . For percentage of bleeding point index in Ist visit was 18.37% and in 2nd visit was 5. 24 % and in 3rd visit was 6.83 %as shown in table -2-

For the comparison between Ist and 3rd visit was shown in table 3 and 4 , the result showed that there was no significant changes occurred in PL.I and gingival enlargement ( P> 0.05 ) While there was significant change occurred in G . I, bleeding point index, WBC count and HB level (p< 0.0.5). However there was high significant change occurred in platelets count (P< 0.001)

The correlation between parameters (clinical and hematological) in Ist visit was show in table -5- It have been found that G.I was directly proportional to PL.I and reversibly proportion to WBC and platelets count . The most relation was with platelets count which was significant (p < 0.05). The gingival enlargement was reversely proportional to PL.I and WBC count, the clearest relation was with WBC count. The G.C.F was directly proportional to PL.I and WBC count and reversely to platelets count, the most clear relation was with WBC count .Finally the bleeding point index was directly proportional to PL.I and WBC count and reversely proportional to platelets count. The most clear relation was with platelets count which was significant (P<0.05).

The same correlation between same parameters were shown in table -6- but in the 3rd visit it have been found that G.I was directly proportional to PL.I which was highly significant (P<0.001) and reversely proportional to WBC and platelets count. The gingival enlargement was directly proportional to PL.I and WBC count, the most clear relation was with PL.I. The G.C.F was directly proportional to PL.I which was significant (P<0.05) and reversely proportional to WBC and platelets count, the most clear relation was with PL.I. Finely the bleeding point index was directly proportional to PL.I which was significant (P<0.05) and reversely proportional to WBC and platelets count, the most clear relation was with PL.I

## Discussion

In this study the comparison between the same parameters measured in the Ist visit before the chemotherapy intake (Day 0) and 3rd visit after chemotherapy intake which was in remission stage of induction phase (Day 30) showed that the G.I bleeding point index and WBC count were decreased significantly in 3rd visit compared to 1st visit while the HB level and G.C.F were increased significantly in 3rd visit in compare to 1st visit. Where as PL.I. was increased and gingival enlargement was decreased but not significantly in 3rd visit in compare to 1st visit However platelets count was highly significant increased in 3rd visit in compare to 1st visit .

This result did not agree with the finding of the study of Oꞌsullivan et al 1994 [23] who stated that no significant changes were found in periodontal condition in ALL children before and after chemo therapy treatment

Also this result is not in accordance with the result of Barrett and Lee 1997

[11] who stated that periodontal problems may progress due chemotherapy intake by AL patients.

The result of gingival enlargement was decreased but not significantly after using chemotherapy treatment, it was in accordance with the result of Weekx 1990 [17] Who stated that generally gingival hyperplasia resolves completely or at least partly with effective Leukemia chemotherapy. Also Pui 1998 [24] found that the amount of blast cell is > 5% in bone marrow of All children and in the end of remission is > 0.01% The results showed that in the 2nd visit it was clear that the means of PL .I, G.I, G.C.F and bleeding point index were decreased while their means were increased in 3rd visit compared to 2nd visit. This result was confirms with Anderson and Thomas 1976 [25] and Denist and Lindhe 1998 [26], Jaime and Fermin 2002 [27] and Susan et al 2002 [28] Who stated that the local factors were aggravating in patients with systemic conditions that lower the resistance of gingiva e. g leukemia and the gingival creviclar fluid is proportional to the severity of gingival inflammation.

This study also showed the correlation between each of G.I, gingival enlargement, G.C.F and bleeding point index (which represent the signs of inflammation) with each PL.I ( which represent the local factor ) , WBC count , platelets count ( which represent the systemic factors ) with exception of gingival enlargement with platelets count in both ( day 0 ) and third visit ( day 30 )

The result reveals that in day 0 the most intimate correlation of G.I, gingival enlargement, G.C.F and bleeding point index was with systemic factors and not with the local factor (PL. I). This reveals that before using the chemotherapy, system factor is of prime importance in inducing gingivitis and bleeding.

However, the result in day 30 revealed that the intimate correlation of G. I, gingival enlargement, G.C.F and bleeding point index were with local factor and to less extend with systemic factors. So the remission stage of induction treatment , when blood picture test showed normal WBC count , platelets count and HB level , the gingival , bleeding and amount of G.C.F are effected by local factor .

This result was in agreement with Anderson and Thomas 1976 [25] and Levy Polack et al 1998 [16] who confirm in their study the importance of local factor in oral hygiene in children with ALL.

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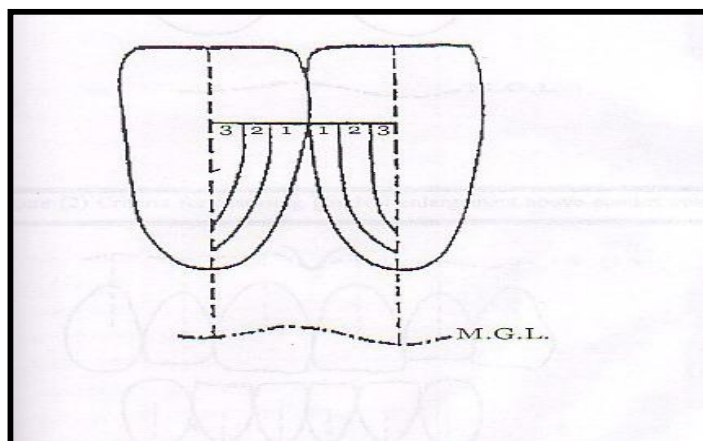
Figure (1): Criteria for assessing gingival encroachment on adjacent tooth surfaces for gingival unit (Seymour et al., 1985)
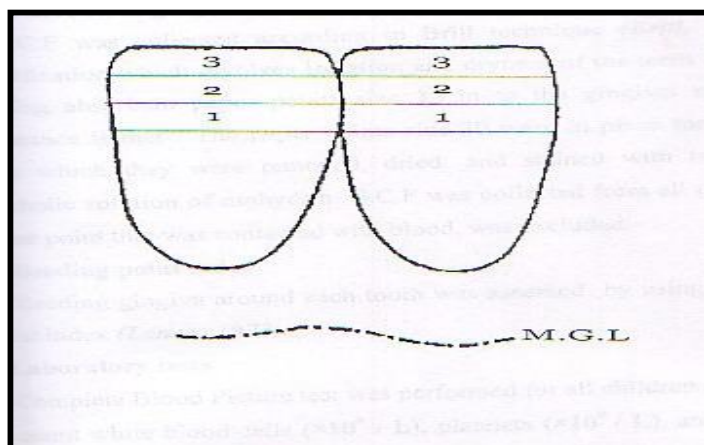
**Figure (2):** Criteria for assessing gingival enlargement above contact point

Table (1): Mean & SD of clinical & hematological p   arameters in three visits

|  | First visit | | Second Visit | | Third Visit | |
|---|---|---|---|---|---|---|
|  | Mean | SD | Mean | SD | Mean | SD |
| PL.I | 0.846 | 0.31 | 0.692 | 0.471 | 0.998 | 0.572 |
| G.I | 0.545 | 0.364 | 0.234 | 0.183 | 0.386 | 0.293 |
| Gingival Enlargement | 0.476 | 0.351 | 0.512 | 0.323 | 0.21 | 0.041 |
| G.C.F | 1.47 | 0.605 | 1.431 | 0.727 | 1.956 | 0.637 |
| WBC Count | 28.81 | 4.871 | 3.666 | 1.281 | 6.2 | 2.144 |
| Platelets Count | 61.46 | 15.365 | 120 | 63.55 | 211.3 | 63.45 |
| Hb Level | 8.626 | 2.271 | 9.412 | 1.478 | 10.646 | 1.452 |

Table (2): The percentage of bleeding point index in three visits

|  | First Visit | Second Visit | Third Visit |
|---|---|---|---|
| Bleeding Point | 18.37% | 5.24% | 6.84% |

Table (3): Comparison of the clinical & hematological parameters between $1^{st}$ & $2^{nd}$ visits.

|  | t-test | P-Value | Sig. |
|---|---|---|---|
| PL.I | 1.134 | 0.276 | NS |
| G.I | 2.082 | 0.049 | S |
| G.C.F. | 3.449 | 0.004 | S |
| Bleeding Point | 2.002 | 0.046 | S |
| Platelets Count | 6.331 | 0.000 | HS |
| Hb Level | 2.666 | 0.018 | S |

$P<0.05$ Significant (S); $P>0.05$ Non Significant (NS) and $P<0.0001$ High Significant (HS).

Table (4): Comparison of Gingival Enlargement & WBC Count between 1st and 3rd Visits.

|  | P-Value | Sig. |
|---|---|---|
| **Gingival Enlargement** | 0.2290 | NS |
| **WBC Count** | 0.0486 | S |

Table (5): Correlation between parameters of first visit

|  | PL.I | P-Value | WBC | P-Value | Plat.Count | P-Value |
|---|---|---|---|---|---|---|
| **G.I** | 0.329 | 0.3232 NS | -0.212 | 0.449 NS | -0.522 | 0.046 S |
| **G.Enlarg.** | -0.118 | 0.676 NS | -0.136 | 0.628 NS |  |  |
| **G.C.F.** | 0.005 | 0.986 NS | 0.344 | 0.210 NS | -0.178 | 0.525 NS |
| **Bleeding Point** | 0.437 | 0.103 NS | 0.079 | 0.780 NS | -0.516 | 0.049 S |

P<0.05 Significant (S) and P>0.05 Non Significant (NS)

Table (6): Correlation between parameters of third visit

|  | PL.I | P-Value | WBC | P-Value | Plat.Count | P-Value |
|---|---|---|---|---|---|---|
| **G.I** | 0.813 | 0.000 HS | -0.176 | 0.530 NS | -0.406 | 0.133 NS |
| **G.Enlarg.** | 0.33 | 0.230 NS | 0.133 | 0.637 NS |  |  |
| **G.C.F.** | 0.579 | 0.024 S | -0.08 | 0.777 NS | -0.071 | 0.801 NS |
| **Bleeding Point** | 0.738 | 0.002 S | -0.14 | 0.618 NS | -0.252 | 0.365 NS |

P<0.05 Significant (S).
P>0.05 Non Significant (NS)
P<0.0001 High Significant (HS).