



# Predictive Factors for Recurrence of Giant Cervical-Mental Keloid Scars in Adults

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## Abstract

The general objective of this study is to identify the predictive factors of recurrence after surgery for cervico-mental keloid of at least  $\geq 10$  cm and reaching the sternum. This is a prospective cohort study of 32 adult Congolese Negroid males who had previously undergone keloidectomy with immediate closure or keloidectomy followed by dressings and then skin grafting. The study covers the period from January 1, 2011, to April 30, 2023, with a follow-up of at least 18 months. The majority of patients (71.7%) were aged between 20 and 49 years. The etiology was traumatic (beard shaving, post-traumatic wounds) in 74.9%. The majority of lesions (68.9%) were between 11 and 20 years. In half of the cases (53%), patients consulted in the presence of the 2nd and 3rd recurrence. Half of the patients received less than 5 sessions of corticosteroid infiltrations, *i.e.*, 59.3%. Half of the cases (56.2%) recurred 2 years after surgery and had a keloid size between 20 - 29 cm long. The most commonly performed type of surgery (71.8%) was intrascar keloidectomy + directed healing and skin graft. Recurrence was observed more in keloidectomy and immediate closure (66.6%) than in keloidectomy + dressings and skin graft (34.3%). Keloidectomy and immediate closure were the sources of abscesses and suppurations in 88.8% of cases. The overall incidence of keloid recurrence is 13.0 (11.4 - 15.6) per 100 P-M. This incidence increases as the months go by. Predictive factors for keloid recurrence are post-surgery infection (31.3 per 100 P-M versus 1.8 per 100 P-M), size  $\geq 30$  cm (RR = 35.3 per 100 P-M) and a size of 20 - 29 cm (RR = 14.1 per 100 P-M), evolutionary duration of  $\geq 10$  years (RR = 23.0 per 100 P-M) and finally immediate simple suture (RR = 1 per 100 P-M). Protective predictive factors were keloidectomy + dressing + graft + corticosteroid therapy. Finally, the Kaplan Meir curve of patients according to secondary procedure performed after keloidectomy shows that the incidence of recurrence is significantly (Log-rank,  $p = 0.029$ ) higher in patients whose secondary procedure

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performed is immediate closure (IC = 19.4 for P-M) compared to those whose secondary procedure is dressings and skin grafts (IC = 9.6 for P-M). It, therefore, emerges from this study that for large keloid scars of the chin and neck at least 10 cm long, intracranial surgery followed by dressings and skin grafts associated with corticosteroid infiltrations gives a low rate of recurrence.

## Subject Areas

Surgery & Surgical Specialties

## Keywords

Large Keloid Scars of the Chin and Neck, Surgery and Immediate Closure, Surgery and Dressings-Skin Graft, Recurrences

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## 1. Introduction

The keloid scar, commonly called keloid, is a benign proliferative skin lesion generally following aggression, sometimes minimal, identified or not, purely lesion of the dermis and developing in the reticular dermis [1]. The causes are not clearly elucidated. Several hypotheses have been put forward to explain their occurrence and frequency according to the populations: hereditary reason [2], immunological [3] [4], hormonal [3] [4], environmental [2] or genetic [2].

The treatment of keloids is not yet well codified [5] [6]. Their management can be divided into non-invasive treatment (ointments/medical creams, massage and occupational therapy; compressions/pressure; intralesional injections of corticosteroids/non-steroidal products; plate or silicone gel) and invasive treatments (surgical excision, laser treatment, cryotherapy, radiotherapy or postoperative radiotherapy) [7]-[11]. Simple surgical revision is nonsense, since recurrence or even worsening are then inevitable [5] [6]. An overall recurrence rate of 30% was noted in a meta-analysis, including 39 studies and comprising 27 different treatments [6].

The problem with this study lies in the fact that patients suffering from large cervico-mental keloid scars return to consultation with new scars of the same nature after even surgically induced treatment. These scars constitute severe aesthetic and functional disorders.

The general objective of this work is to identify the predictive factors for the recurrence of cervico-mental keloid after surgery.

## 2. Materials and Methods

This was a prospective cohort study of large infected cervico-mental keloid scars. The study period was from January 1, 2011, to April 30, 2023. With a follow-up of at least 18 months, the study was completed on October 30, 2024. This study took place at the Plastic Surgery Departments of the University Clinics of Kinshasa and the Cinquantenaire Hospital in Kinshasa, Democratic Republic of Congo.

The population of this study consisted of all Negroid patients operated on for large infected mento-cervical keloids. Of the 49 patients registered, only 32 were the subject of this study. They met our eligibility criteria. The eligibility criteria were: patient who underwent surgery for large cervico-mental keloids by conventional surgery associated or not with other treatment (corticosteroids, pressure therapy, silicone gel); Patient operated by in the Plastic Surgery Departments of the University Clinics of Kinshasa and the Cinquanteenaire Hospital; Patient operated and whose follow-up was at least 18 months.

The study variables were: Age, Race, Nationality, Initial lesion (etiology), Age/duration of the lesion, Frequency of recurrence (number of recurrences), Number of corticosteroid infiltrations, Time to appearance of recurrence after surgery, Size of the keloid, Type of surgery performed, Result of surgery after 18 months, Evolution after surgery, Operative findings, Culture.

The data were compiled in an Excel 2010 database of patients followed up at 18 months who underwent keloidectomy, after verification and cleaning, these data were exported to SPSS for Windows version 24 for analyses. The results were presented as means (+ standard deviation), medians (IQR) and proportions (%) as appropriate; student t-tests (Wilcoxon test) were performed to compare continuous variables with Gaussian distribution. The Man Whitney U test compared the medians of continuous variables with non-Gaussian distribution and the Pearson Chi-square or Fischer exact test was performed to compare proportions. For the Kaplan-Meier survival function estimating the probability of keloid recurrence, the comparison of the two groups used the Log-rank test. Cox regression was used to search for predictive factors of keloid recurrence after surgery, the Relative Risk (RR) and the 95% confidence interval (95% CI) were calculated to estimate the risk of recurrence. The statistical significance threshold was set at  $p < 0.05$ .

We considered as bulky keloid scars chin-cervical, those whose length was each at least  $\geq 10$  cm.

Ethical considerations consisted of respecting hospital documents and confidentiality of all the particularities of the patients' files.

## Surgical Techniques

Reconstructive surgery for keloid scars may include a different treatment, surgical excision of the entire keloid scar with directed healing. Several coverage solutions can be used: skin graft, artificial dermis, and flap. The treatment will most often be discussed in a multidisciplinary consultation meeting in order to provide the best solution and thus prevent recurrence. Once the healing process has been acquired, adjuvant treatment is recommended as a preventive measure to avoid relapse: corticosteroid therapy, radiotherapy, cryotherapy, and pressotherapy. If the scar is fibrous, surgical treatment with intra-scar excision is recommended. It is especially important not to perform excision of the entire keloid because this will increase the risk of extending it.

Intra-scar injection of keloid scars is performed along the entire length of the

dermis, and only in the latter in order to avoid irreversible atrophy of the epidermis via a micro-syringe or a Dermojet device (needleless pen-type syringe) in the scar. The active substance injected is triamcinolone acetonide (KENACORT RETARD®) in 40 mg or 80 mg, depending on the surface to be treated.

### 3. Results

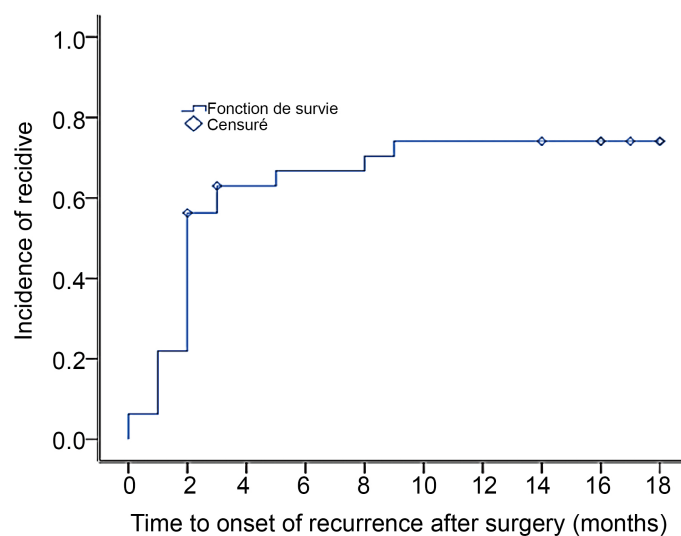
All patients were male, Negroid and of Congolese nationality. The majority of patients (71.7%) were aged between 20 and 49 years. The etiology was traumatic (shaving of beard, post-traumatic wounds) in 74.9%. The majority of lesions (68.9%) lasted between 11 and 20 years. In half of the cases (53%), patients consulted in the presence of the 2nd and 3rd recurrence. Half of the patients benefited from less than 5 sessions of corticosteroid infiltrations, *i.e.*, 59.3%. Half of the cases (56.2%) relapsed 2 years after the surgical procedure and had a keloid size between 20 - 29 cm long. The most commonly performed type of surgery (71.8%) was intracatrical keloidectomy + directed healing and skin graft. The results of surgical treatment after 18 months of follow-up are presented in **Table 1**.

**Table 1.** Results of surgical treatment after 18 months of follow-up.

Surgery	N	Recurrence	
		+ n (%)	-n (%)
Keloidectomy and immediate closure	9	6 (66.6)	3 (33.0)
Keloidectomy + dressings then skin graft	23	11(34.3)	22 (68.7)

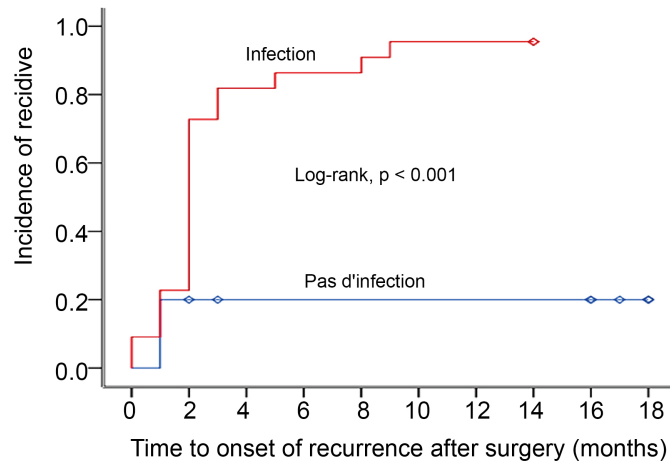
Recurrence was observed more in keloidectomy and immediate closure (66.6%) than in keloidectomy + dressings and skin graft (34.3%). Keloidectomy and immediate closure were the sources of abscesses and suppurations in 88.8% of cases.

**Figure 1** presents the incidence of keloid recurrence in the study population.



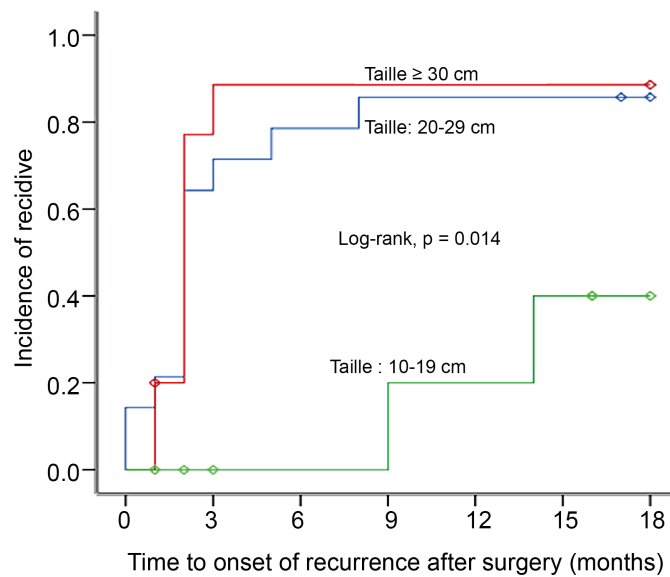
**Figure 1.** Incidence of keloid recurrence in the study population.

The median duration of post-surgical follow-up was 14.0 (IQR: 13 - 17) months with extremes varying between 2 and 18 months. The overall incidence of keloid recurrence was 13.0 (11.4 - 15.6) per 100 P-M. This incidence increased as the number of months increased (**Figure 2**).



**Figure 2.** Cumulative incidence of recurrence according to post-surgical outcomes.

This figure presents the Kaplan-Meier curve of the probability of recurrence according to post-surgical outcomes and shows that the probability of keloid recurrence was significantly higher than in patients who had experienced a post-surgical infection (31.3 per 100 P-M vs. 1.8 per 100 P-M in patients without infection; Log-rank,  $p < 0.001$ ) (**Figure 3**).



**Figure 3.** Cumulative incidence of recurrence according to keloid size.

The incidence of keloid recurrence according to its size is described in **Figure**

3. It is noted that the incidence of recurrence was higher in patients with a size greater than or equal to 30 cm (CI = 35.3 per 100 P-M) and a size between 20-29 cm (CI = 14.1 per 100 P-M) compared to those with a size between 10 and 19 cm (CI = 2.5 per 100 P-M), the difference was statistically significant (Log-rank,  $p = 0.014$ ) (Figure 3).

The incidence of recurrence of keloids of varicella etiology was 20.60 per 100 P-M, that of shaving etiology was 15.2 per 100 P-M and that of ATR etiology was 3.9 per 100 P-M. Comparison of the Kaplan Meier curves of patients according to etiology showed that the incidence of recurrence was significantly (Logrank,  $p = 0.023$ ) higher in patients with keloid varicella etiology and shaving (Figure 4).

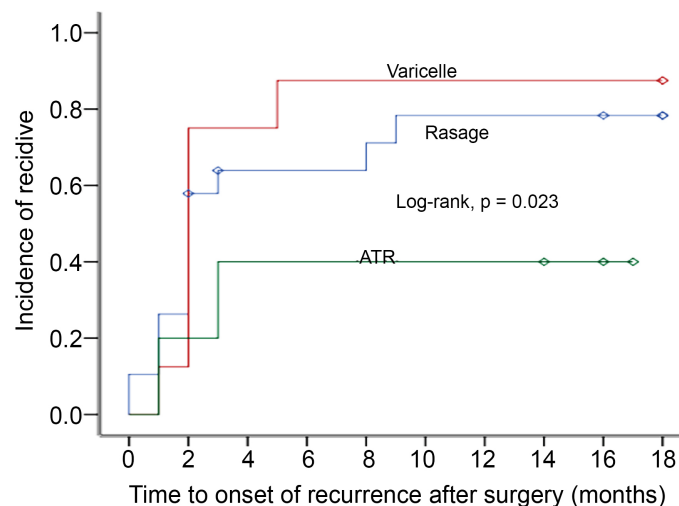
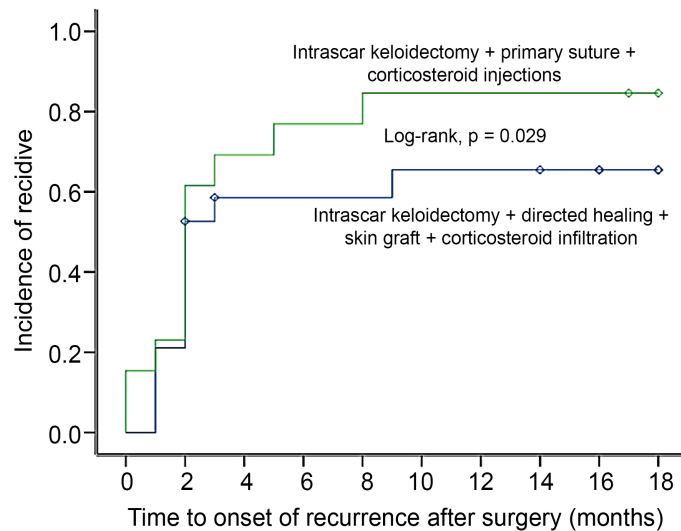


Figure 4. Time to onset of recurrence after surgery.

The Kaplan Meier curve of patients according to secondary procedure performed after keloidectomy showed that the incidence of recurrence was significantly (Log-rank,  $p = 0.029$ ) higher in patients whose secondary procedure performed was infiltration (CI = 219.4 per 100 P-M) compared to those whose secondary procedure was dressing + skin graft + infiltration (CI = 9.6 for P-M) (Figure 5).

The overall incidence of keloid recurrence was 13.0 (11.4 - 15.6) per 100 P-M. This incidence increased as the months went by. Predictive factors for keloid recurrence were post-surgery infection (31.3 per 100 P-M versus 1.8 per 100 P-M), size  $\geq 30$  cm (RR = 35.3 per 100 P-M) and size of 20-29 cm (RR = 14.1 per 100 P-M), evolutionary duration of  $\geq 10$  years (RR = 23.0 per 100 P-M) and finally immediate simple suture (RR = 1 per 100 P-M). Protective predictive factors were keloidectomy + dressing + graft + corticosteroid therapy. Finally, the Kaplan Meier curve of patients according to secondary procedure performed after keloidectomy shows that the incidence of recurrence is significantly (Log-rank,  $p = 0.029$ ) higher in patients whose secondary procedure performed is immediate closure (IC = 19.4 for P-M) compared to those whose secondary procedure is dressings and skin

grafts (IC = 9.6 for P-M).



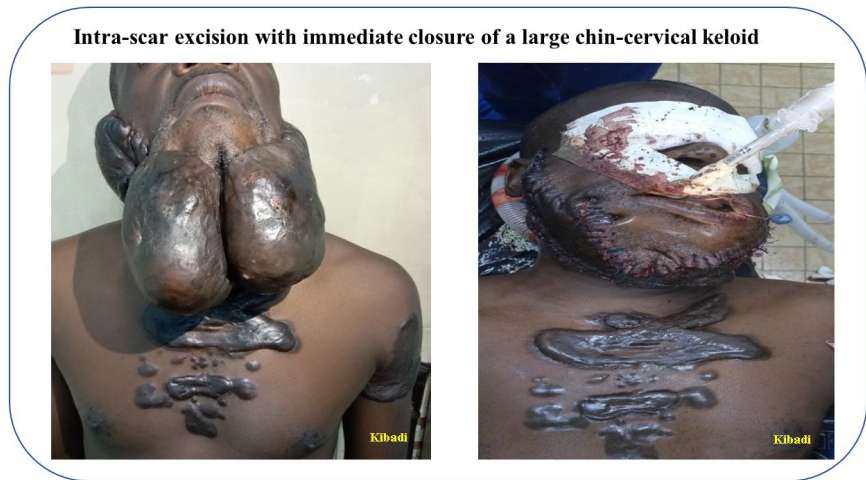
**Figure 5.** Cumulative incidence of recurrence according to secondary procedure performed after keloidectomy.

After adjustment for these variables in multivariate analysis, patients with keloids following varicella (RRa: 3.19 95% CI: 2.62 - 3.88); patients with keloid duration  $\geq 10$  years (RRa: 3.01 95% CI: 1.86 - 5.33); those with keloid size  $\geq 30$  cm (RRa: 5.02 95% CI: 2.36 - 8.77); patients with post-surgical infection (RRa: 2.38 95% CI: 1.89 - 3.21) and those with less than 5 infiltrations were significantly predisposed to recurrence. On the other hand, the fact that a patient had benefited from a dressing + skin graft post-keloidectomy reduced by 4 (RRa: 0.23 95% CI: 0.12 - 0.74) the risk of keloid recurrence.

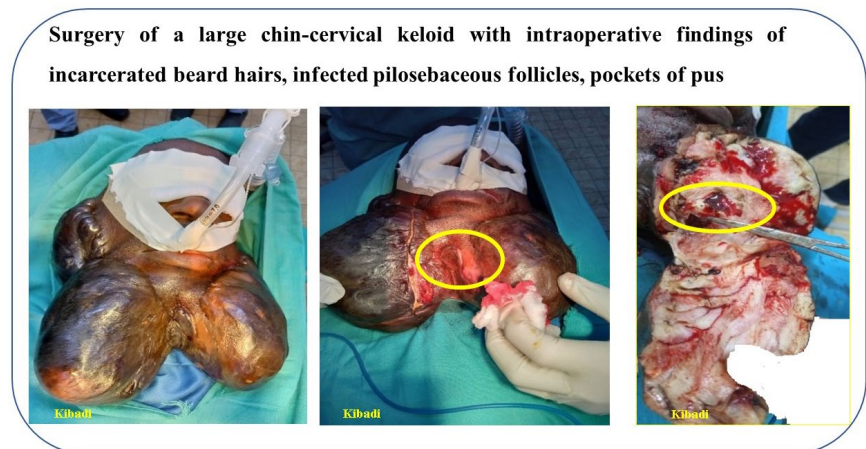
**Figures 6-9** illustrate our surgery.



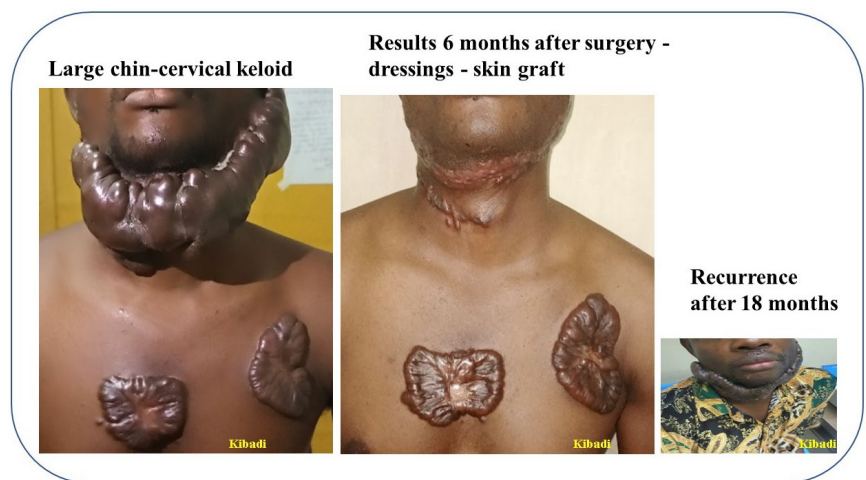
**Figure 6.** Illustrates a large chin-cervical keloid more than 10 cm long and reaching the sternum (front and profile view).



**Figure 7.** Illustrates the intra-scar excision with immediate closure of a large chin-cervical keloid.



**Figure 8.** Shows the surgery of a large chin-cervical keloid with intraoperative findings of incarcerated beard hairs, infected pilosebaceous follicles, pockets of pus.



**Figure 9.** Illustrates the surgery of a large chin-cervical keloid, the results 6 months after surgery—dressings—skin graft as well as the recurrence of the keloid after 18 months.

## 4. Discussion

### 4.1. General Characteristics of the Study Population

It should be noted that publications on pathological scars (hypertrophic and keloids) in the Democratic Republic of Congo (DRC) exist; mainly by Mushegera *et al.* [12] on epidemiological, etiopathogenic and clinical approaches; and by Kibadi *et al.* [13] [14] on restorative approaches, in Goma, by Lemperle G *et al.* on classifications of keloids into surgical-medical approaches [15]. The prevalence of keloids in the city of Kinshasa, the capital of the DRC, was estimated at 13.5%, and that of hypertrophic scars 29.17% [12].

In our series, the majority of patients (71.7%) were aged between 21 and 49 years. The mean age was 38.6 years (range 20 - 72), all Congolese Negroids.

Keloid scars are lesions of young adults. Edington and Gilles, cited by Martinet L, reported that Caucasian subjects who had lived in the tropics for a long time developed a greater susceptibility to keloids. Factors that could be incriminated would be sunshine, nutrition and multiple antigenic stimulations related to the tropical environment [16].

### 4.2. Related Characteristics of the Peroperative Discovery

In our series, beard hairs associated with pus pockets were found in more than 1 patient/10 or 68.9% and less than 1 patient/10 or 3.1% had pus pockets without beard hairs.

Infection of the pilosebaceous follicle is responsible for the development of pockets of pus due to ingrown beard hairs.

### 4.3. Recurrences after Surgical Treatment of Large Chin-Cervical Keloid Scars

In our series, primary sutures recorded a high recurrence rate in 6/9 patients or 66.6%. Directed healing had a low recurrence rate and allowed local management of the lesion site using moist antiseptic dressings, the product used being Kibadi Solution [17].

Let us remember that infection plays a role in wound healing because it prolongs healing or serves as a factor promoting the occurrence of lesions. Also, the hair follicle containing sebum which in a field with poor hygiene is a source of infection (with staphylococcus anaerobic germs). Hence, it is important to have good local management before healing.

In our study, the postoperative infection rate is lower in directed healing than in first-intention sutures with 30.4% versus 88.8%. Management of the lesion site before closure is important. The average time between surgery and recurrence was 18 - 24 months.

Several authors, including Mushegera [12], Martinez [16], Kibadi *et al.* [14], Ruolin *et al.* [18], have demonstrated, as in our study, a recurrence after the same period, *i.e.* 18 - 24 months. Laurence Martinez even insisting on compliance with post-surgery follow-up with at least 6 sessions of corticosteroid injections, bra-

chytherapy.

#### 4.4. Predictive Factors of Keloid Recurrence after Surgery

In our series, the predictive factors of recurrence were affirmatively infection in the initial lesions [varicella RRa 3.19 (2.62 - 3.88)  $p < 0.001$ ], postoperative infection [RRa = 2.38 (1.89 - 3.21)  $p < 0.033$ ], size more than 30 cm [RRa = 5.02 (2.36 - 8.77)  $p < 0.001$ ] and duration of more than 10 years [3.01 (1.86 - 5.33)  $p < 0.001$ ]. The protective predictive factors were keloidectomy, directed healing + skin graft and infiltration leading to a lower rate of recurrence [RRa = 0.23 (0.12 - 0.74)  $p < 0.001$ ].

The number of infiltrations showed that the incidence of recurrence (Log-rank  $p < 0.001$ ) was higher in patients with a number of infiltrations of less than 5 (CI = 2.8 per 100 P-M) (Figure 5), the RRa = 1. Martinez also proposed several infiltrations in the hope of obtaining a satisfactory result. However, he did not define the number of infiltrations; he observed a high number of recurrences in patients lost to follow-up who had only received 2 infiltrations.

#### 4.5. Limitations of the Study

Despite the limitations of this study (small number of patients, absence of certain statistical tests, single-center study), it was able to show that giant cervico-mental keloid remains a reality in our environment, and it is accompanied by recurrence. Predictive factors for recurrence are infection, size  $\geq 10$  cm, progression duration of several years, primary suture, reduced number of corticosteroid infiltrations (less than 5 sessions).

### 5. Conclusions

The large chin-cervical keloids, in our population of Congolese Negroid adults, are mostly infected. Pseudo-folliculitis of the beard, ingrown hairs are the cause. The secondary act after keloidectomy shows that directed healing; dressing that manages the infected site, associated with thin skin graft and infiltration constitutes a protective predictive factor of recurrence with a lower rate of it.

At the end of this study, we therefore recommend intra-scar surgery for large keloids that are more than 10 cm long, which is an absolute indication. It must be associated with healing directed by dressing-skin graft then infiltrations (at least 5 infiltrations) to hope to have good results.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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