Intralesional Corticosteroid Therapy in Hemangiomas: Clinical Outcome in 160 Cases

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Background: *Hemangiomas, one of the most common childhood neoplasms, exhibit a characteristic history of rapid proliferation and slow spontaneous involution. Most of hemangiomas are often managed conversatively, requiring numerous years for spontaneous involution. However, hemangiomas can threaten function in 10% to 20% of cases, less than 1% are truly life threatening. All these serious hemangiomas require treatment to avoid severe sequelae and in some rare cases to save the infant's life.*

Objective: *To evaluate the efficacy, side effects, and influencing factors of intralesional triamcinolone in enhancing regression of various sizes and locations of hemangiomas and to discuss the optimal time and interval of the treatment.*

Material and Method: *The retrospective study was done on 160 pediatric patients with hemangiomas, treated with intralesional triamcinolone injection at age 1 month to 15 years by the author at Queen Sirikit National Institute of Child Health from March 1995 to March 2008. Data were collected from interviews, examinations, medical records, photographs and telephone conversations. Standard statistical methods were used for comparison. The hemangioma sizes were classified into small (> 0-3 cm), medium (> 3-6 cm) and large (> 6-9 cm). Indications for the treatment were rapidly growing lesions, lesions with visual problems, bleeding, ulceration and cosmetic concern. Intralesional injection of triamcinolone was given in a dose of 1 to 2 mg/kg of body weight (maximum of 60 mg). The interval between the treatments varied from 4 to 12 weeks. Most patients were followed up at monthly interval at least 14 months through clinic visits. Mean follow-up was 3.6 years (range 14 months to 12 years).*

Results: *One hundred and sixty patients, 111 girls and 49 boys were treated with this technique. The mean age at first injection was 16.1 months, with a range from 2 months to 9 years. The number of intralesional triamcinolone injection varied from single injection to twelve injections with a mean of 5.7 injections. The overall response rate was 90% (excellent at 70% and good at 20%). Maximum response was observed in children below the age of 1 year (excellent at 77.8% and good at 15.7%) and parotid hemangiomas (excellent at 93.1% and good at 6.9%). The difference between hemangiomas sizes and treatments interval result was not of statistical significance.*

Conclusion: *Intralesional administration of triamcinolone was devoid of systemic side effects and an effective initial modality for rapidly growing hemangiomas.*

Keywords: *Hemangioma, Intralesional corticosteroid therapy, Intralesional triamcinolone injection*

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Hemangiomas are the most common of all human birth defects. Hemangiomas occur in approximately 1 of 100 normal newborns and in 1 of 5 premature infants with birth weight below 1000 g Hemangiomas occur 4 times more frequently in females than males. They rapidly grow for the first year of life (proliferating phase), slow down during the next 5 years (involuting phase), and then gradually regress by 10-15 years of age (involuted phase)[1,2]. Most hemangiomas do not need treatment and it is safe to wait for them to undergo natural involution; however, during these years of waiting, there is undoubtedly a psychological

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burden on the family members. In some cases, hemangiomas can be severely problematic such as interfering with eating, breathing, seeing, hearing, speaking, etc.

However, approximately 10% of hemangiomas cause serious tissue damage and approximately 1% is life threatening. Most complications of hemangiomas develop during the first 6 months, when growth is most rapid. These complications include ulceration, bleeding, infection, compromise of vital functions, and in rare instances congestive heart failure. While all hemangiomas eventually involute, the result is not always cosmetically acceptable. Early intervention has been shown to reduce the need for corrective surgery after involution has occurred or, at least, to minimize extensively corrective surgeries in the future[2,3].

Considerable controversy exists concerning the management of hemangiomas. Active treatment is, as a rule, unnecessary. In some instances, the rapid growth may be responsible for severe cosmetic disfigurement, or may even endanger life. The decision to employ active therapy must be determined by the hemangiomas' individual features such as rapidity of growth and its anatomical location.

For more than 25 years, corticosteroids have been the standard therapy worldwide for serious or life-threatening hemangiomas cases. However, this therapy leaves much room for improvement. In only 30% of infant do hemangiomas undergo rapid involution (*e.g.* regression of the lesion beginning in 1 week), and these patients are at increased risk for infection, peptic ulceration, hyperglycemia, poor wound healing, and stunted growth[2].

Several authors have reported successful management by systemic corticosteroid, with potentially serious side effects[4-8].

Mazzola[9] first reported the use of intralesional corticosteroid injection for the treatment of hemangiomas in detail. Subsequently, other reports have appeared indicating good results with this technique.

Gopal et al have used low dose, systemic corticosteroid therapy since 1970 and found satisfactory results. But due to the various side effects, intralesional injection of triamcinolone was tried on 105 patients and the result was reported in 1995. These investigators concluded that intralesional injection of steroid is safe and effective for treatment of hemangiomas[10,11].

The author has been treating hemangiomas with intralesional injection of corticosteroids in Queen Sirikit National Institute of Child Health since 1992. The 160 patients who were treated by the author in this manner were evaluated.

Objective

To evaluate the efficacy, side effect, and influencing factors of intralesional triamcinolone in enhancing regression in various sizes and locations of cutaneous hemangiomas and to discuss the optimal time and interval of the treatment.

Material and Method

The retrospective study concerns the treatment of hemangiomas, by intralesional triamcinolone injection with patients between the ages of 1 month to 15 years. One hundred and sixty patients treated by the author in Queen Sirikit National Institute of Child Health from March 1995 to March 2008 and followed up for at least 14 months were chosen. Data were collected from interviews, examinations, medical records, photographs and telephone conversations.

The hemangioma sizes were classified into small (> 0-3 cm), medium (> 3-6 cm) and large (> 6-9 cm). Indications for the treatment were rapidly growing lesions (102 cases), lesions with visual problems (11 cases), bleeding (12 cases), ulceration (21 cases) and cosmetic concern (14 cases).

Intralesional injection of triamcinolone was given in a dose of 1 to 2 mg/kg of body weight (maximum of 60 mg). The injection was given by a 26 gauge needle with low injection pressure at three different treatment intervals (4 weeks, 8 weeks, and 12 weeks). Injections were done directly into the hemangioma in several different directions through the same needle puncture site. Direct pressure was applied with sterile gauze for 2 to 10 minutes until all bleeding had stopped. Most patients were followed up monthly. In each visit, besides detailed examination of the hemangioma, assessment was also made for side effects and response to the treatment.

The response to the treatment was analyzed by grading scale performed by Sloan, Reinisch, and Nichter[12] ; this grading scale is summarized in Table 1.

Table 1. Grading scale used to evaluate responses of hemangiomas to intralesional corticosteroid therapy

Excellent	Near-total disappearance
Good	Greater than 50 percent reduction in volume
Fair	Definite reduction in volume, but by less than 50 percent
Poor	Little or no decrease in size

Statistical analysis

Chi-square test was used for measuring the association of categorical variables and Student's t-test was implemented for comparing the mean of numerical variables for different groups. Results were expressed as number and percent (%) of patients in contingency tables. The value of $p < 0.05$ was considered a statistically significant difference.

Results

A total of 160 patients were 111 girls and 49 boys. The mean age at first injection was 16.1 months, with a range from 2 months to 9 years. The number of injections varied from single injection to twelve injections with a mean of 5.7 injections. Because of good results, 5 patients received only single injection. Mean follow-up was at 3.6 years (range 14 months to 12 years).

The response rates from this treatment modal in various age at first injection, different intervals of treatment, sizes and locations of hemangiomas are shown in Table 2. The incidents of complications in various ages at first injection and locations of hemangiomas are shown in Table 3. Post treatment scars in various locations are shown in Table 4.

Discussion

The mechanism of action of steroids is not clearly understood. Zarem and Edgerton[13] showed minimal inflammatory activity in biopsy specimens of hemangiomas in 3 of their patients, while Edgerton[4] has shown that steroids tend to sensitize the vascular bed to vasoconstricting agents. Steroids are considered as an angiogenic inhibitor in the presence of heparin[1]; hormone receptors are considered important in mediating the action of steroids on proliferating hemangiomas[6,7]. Gangopadhyay AN et al[11] noticed that the effect of intralesional triamcinolone was more on hemangiomas with finer vessels (strawberry and mixed). From this observation, these investigators concluded that the above mentioned theory of sensitization of the vascular bed to vasoconstricting agents

Table 2. Detail of clinical responses to treatment

Results & Age, Interval, Location and Sizes		Poor No. (%)	Fair No. (%)	Good No. (%)	Excellent No. (%)	Total No. (%)	p-value
Age at first injection	> 1 months-6 months	0	5 (7.9)	10 (15.9)	48 (76.2)	63 (100)	0.015
	> 6 months-12 months	1 (2.2)	1 (2.2)	7 (15.6)	36 (80.0)	45 (100)	
	> 12 months-24 months	1 (4.8)	1 (4.8)	6 (28.6)	13 (61.9)	21 (100)	
	> 2 years-6 years	2 (9.1)	2 (9.1)	5 (22.7)	13 (59.1)	22 (100)	
	> 6 years-15 years	0	3 (33.3)	4 (44.4)	2 (22.2)	9 (100)	
	Total	4 (2.5)	12 (7.5)	32 (20.0)	112 (70.0)	160 (100)	
Interval	4 weeks	0	7 (9.5)	16 (21.6)	51 (68.9)	74 (100)	0.198
	8 weeks	1 (2.8)	1 (2.8)	10 (27.8)	24 (66.7)	36 (100)	
	12 weeks	3 (6.7)	3 (6.7)	6 (13.3)	33 (73.3)	45 (100)	
	Total	4 (2.6)	11 (7.1)	32 (20.6)	108 (69.7)	155 (100)	
Location	Parotid gland	0	0	2 (6.9)	27 (93.1)	29 (100)	0.335
	Eye lid	0	1 (9.1)	4 (36.4)	6 (54.5)	11 (100)	
	Lip	2 (8.0)	3 (12.0)	7 (28.0)	13 (52.0)	25 (100)	
	Forehead	0	1 (7.1)	3 (21.4)	10 (71.4)	14 (100)	
	Cheek	0	1 (5.3)	6 (31.6)	12 (63.2)	19 (100)	
	Nose	1 (14.3)	1 (14.3)	1 (14.3)	4 (57.1)	7 (100)	
	Upper extremity	0	2 (10.5)	3 (15.8)	14 (73.7)	19 (100)	
	Trunk	1 (7.1)	0	1 (7.1)	12 (85.7)	14 (100)	
	Lower extremity	0	1 (14.3)	1 (14.3)	5 (71.4)	7 (100)	
	Miscellaneous	0	2 (13.3)	4 (26.7)	9 (60.0)	15 (100)	
	Total	4 (2.5)	12 (7.5)	32 (20.0)	112 (70.0)	160 (100)	
Sizes	Small	4 (4.4)	7 (7.8)	22 (24.4)	57 (63.3)	90 (100)	0.264
	Medium	0	4 (9.3)	7 (16.3)	32 (74.4)	43 (100)	
	Large	0	1 (3.7)	3 (11.1)	23 (85.2)	27 (100)	
	Total	4 (2.5)	12 (7.5)	32 (20.0)	112 (70.0)	160 (100)	

Table 3. Complications of intralesional steroid treatment

Complications & Age, Location		Ulceration No. (%)	Hypo pigmentation No. (%)	Peptic ulcer No. (%)	Entropian No. (%)	No complication No. (%)	Total No. (%)	p-value
Age at first injection	> 1 months-6 months	3 (4.8)	1 (1.6)	0	1 (1.6)	58 (92.1)	63 (100)	0.731
	> 6 months-12 months	1 (2.2)	1 (2.2)	1 (2.2)	0	42 (93.3)	45 (100)	
	> 12 months-24 months	1 (4.8)	0	0	0	20 (95.2)	21 (100)	
	> 2 years-6 years	1 (4.5)	0	0	0	21 (95.5)	22 (100)	
	> 6 years-15 years	0	0	1 (11.1)	0	8 (88.9)	9 (100)	
	Total	6 (3.8)	2 (1.3)	2 (1.3)	1 (.6)	149 (93.1)	160 (100)	
Location	Parotid gland	0	0	1 (3.4)	0	28 (96.6)	29 (100)	0.635
	Eye lid	0	0	0	1 (9.1)	10 (90.9)	11 (100)	
	Lip	1 (4.0)	0	0	0	24 (96.0)	25 (100)	
	Forehead	0	0	0	0	14 (100)	14 (100)	
	Cheek	1 (5.3%)	0	0	0	18 (94.7)	19 (100)	
	Nose	0	0	0	0	7 (100)	7 (100)	
	Upper extremity	2 (10.5)	1 (5.3)	1 (5.3)	0	15 (78.9)	19 (100)	
	Trunk	1 (7.1)	0	0	0	13 (92.9)	14 (100)	
	Lower extremity	0	0	0	0	7 (100)	7 (100)	
	Miscellaneous	1 (6.7)	1 (6.7)	0	0	13 (86.7)	15 (100)	
	Total	6 (3.8)	2 (1.3)	2 (1.3)	1 (0.6)	149 (93.1)	160 (100)	

Table 4. Post treatment scars in various locations

Scar & Location		Severe No. (%)	Moderate No. (%)	Minimal No. (%)	No scar No. (%)	Total No. (%)	p-value
Location	Parotid gland	0	1 (3.4)	15 (51.7)	13 (44.8)	29 (100)	0.000
	Eye lid	0	5 (45.5)	5 (45.5)	1 (9.1)	11 (100)	
	Lip	0	16 (64.0)	9 (36.0)	0	25 (100)	
	Forehead	0	3 (21.4)	7 (50.0)	4 (28.6)	14 (100)	
	Cheek	2 (10.5)	6 (31.6)	10 (52.6)	1 (5.3)	19 (100)	
	Nose	1 (14.3)	5 (71.4)	1 (14.3)	0	7 (100)	
	Upper extremity	0	12 (63.2)	6 (31.6)	1 (5.3)	19 (100)	
	Trunk	0	4 (28.6)	7 (50.0)	3 (21.4)	14 (100)	
	Lower extremity	0	2 (28.6)	2 (28.6)	3 (42.9)	7 (100)	
	Miscellaneous	0	9 (60.0)	5 (33.3)	1 (6.7)	15 (100)	
	Total	3 (1.9)	63 (39.4)	67 (41.9)	27 (16.9)	160 (100)	

is probably the most importance mechanism for regression of hemangioma.

Numerous reports of hemangiomas successful treatment by direct intralesional steroids have appeared in the ophthalmic literature[14-17]. Satisfactory results and few complications encourage this application for treating hemangiomas rather than periorbital location[18]. It is reported, however, about various factors that affect this treatment. The research results done by Gangopadhyay AN et al[11] on 105 patients found that the patients under the age of 1 year yield more successful results, which is consistent with the present conclusion (Table 2). It can be seen that the treatment for patients that are under the age of 1 year yield more successful results than the older patients at a statistical significance (p = .005). Additionally, the results from the present study show that the side effects from this treatment's application are minimal and no statistical significance with different ages at first injection (Table 3). Therefore, it could be concluded that the appropriate age for this treatment's application is below 1 year old, which yield excellent results

with minimal side effects and such side effects would not cause significant problems.

Most treatment would be at monthly interval of treatment. Chen et al[19] have treated 155 cases of patients suffering from proliferating head and neck hemangiomas by monthly treatment intervals and reported response rates as high as 85% and from research done by Gangopadhyay AN et al[11] on 105 patients by monthly treatment interval; it was found that treatment interval yielded excellent result at 75%. The researcher treated 75 patient at 4-weeks intervals, 36 patients at 8-weeks interval and 45 patients at 12-weeks interval. From the treatment intervals result (Table 2), it was found that all groups yielded excellent results with no statistical differences ($p = 0.198$).

Metry DW et al[20] has suggested that intralesional steroid injections would only yield good results when treating hemangiomas having a size of 3 centimeters or less; however, from the research done by the author (Table 2), it was found that the hemangiomas having a size larger than 6 centimeters, yielded excellent results at 85.2%. When the treatment for small, medium and large hemangiomas were compared, it was determined that no statistically significant differences were found ($p = 0.264$).

Sloan GM[12] has suggested that injections of corticosteroid into tumors should be considered for a small, well-localized cutaneous hemangioma, typically for lesions located on the nasal tip, cheek, lip, or eyelid. From the research done by Gangopadhyay AN et al[11], it was found that the treatment of facial hemangiomas yielded the best results. Whereas the author's research was found that treatment of parotid hemangiomas yielded the excellent results at 93.1% (Table 2) and no scar was found after the treatment of 44.8% (Table 4) with only one patient having side effects. Such patient was suffering from peptic ulcer during treatment. After receiving antacid for roughly 2 weeks, no symptom were found.

Greene AK et al[21] have studied parotid hemangiomas in 100 children and it was found that 59% of parotid hemangiomas ulcerated during the early proliferating phase. Eighty-eight percent involve near by structures (ear at 70 percent; lip at 34 percent; subglottic region at 21 percent; eye at 18 percent; and nose at 3 percent). Seven percent of patients required tracheostomy, and 3 percent had signs of congestive heart failure.

From Reinisch JF et al[22] report of 17 children who underwent surgical resection of parotid hemangiomas, it was found that during surgery, blood transfusion needed to be given to 5.9%, also found was transient facial nerve palsy 11.8% and hematoma 11.8% were found after the surgery.

Wang et al[23] report on 19 children who underwent surgical resection for parotid hemangiomas, it was also found 3 cases of partial facial nerve palsy after the surgery.

From the author's experience, it was found that parotid hemangiomas would rapidly grow during the first year. Most of hemangiomas would be large and usually expanded to the neck, which would be hazardous for patients. Therefore, the author applied this technique as treatment and gained satisfactory result with very low side effects, which is deemed a good tendency for parotid hemangioma treatment without any surgery.

Kushner et al[24] report on 25 patients with periorbital hemangiomas who were treated with intralesional corticosteroid injection; excellent results were found in 16 patients (64%); however, complications; amblyopia and strabismus were found in up to 16%.

The author treated 11 patients with periorbital hemangiomas and it was found that 6 cases (54.5%) yielded excellent results and there was entropian complication in only one case (9.1%).

Even if the lip and nose hemangiomas were small size; lip hemangioma treatment had excellent results at the middle level, 52.0% excellent result and nose hemangioma treatment result was at the middle level with 57.1% excellent result. Ulceration usually occured prior to the treatment for nose hemangioma leading to scar formation before the treatment started. Lip hemangioma seldom ulcerated before or during treatment, but minimal and moderate scars were usually seen after involution. After the treatment, it can be seen that moderate scaring usually resulted from lip hemangioma up to 64.0% and moderate and severe scarring from the nose hemangioma up to 71.4% and 14.3% respectively (Table 4).

Conclusion

The author concludes that intralesional injection of steroids is safe and effective for treatment of hemangiomas. To get optimum response, it should be used in patients below one year of age. Parotid hemangioma responsed best to this therapy. Large size hemangiomas may also be treated with excellent results by this technique. Another advantage of intralesional steroids is that, unlike systemic steroid, it is free from major side effects. Even if most hemangiomas would

disappear by itself; however, the author believes that close follow-ups with patients are of extreme importance in treating capillary hemangioma, especially during the first year, which is the period of rapid growth and may result in serious complications; if hemangioma treatment is neccessary, this technique will yield excellent results.

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การรักษาเนื้องอก hemangiomas โดยการฉีดยา คอร์ติโคสเตียรอยด์ ที่ตำแหน่งของเนื้องอก: ผลการรักษาในผู้ป่วย 160 ราย

วิรัตน์ จันทรัตนไพบูลย์

ภูมิหลัง: *เนื้องอก hemangiomas จัดเป็นเนื้องอกที่พบได้บ่อยที่สุดชนิดหนึ่งในวัยเด็ก มักจะโตอย่างรวดเร็วในช่วงแรกและค่อย ๆ ยุบลงและหายไปเองเมื่ออายุมากขึ้น เนื้องอก hemangiomas ส่วนใหญ่มักจะไม่ต้องการการรักษา แต่ต้องใช้เวลาหลายปีเพื่อรอให้ก้อนหายไปเอง อย่างไรก็ตาม 10% ถึง 20% ของเนื้องอกชนิดนี้อาจจะก่อให้เกิดปัญหาต่อผู้ป่วย นอกจากนี้ยังพบว่าประมาณเกือบ 1% ของเนื้องอกชนิดนี้อาจจะเป็นอันตรายต่อชีวิตผู้ป่วยได้ เนื้องอกที่ทำให้เกิดปัญหาเหล่านี้ต้องการการรักษาเพื่อป้องกันผลข้างเคียงที่จะติดตามมา และในบางรายเพื่อปกป้องชีวิตของผู้ป่วย*

วัตถุประสงค์: *เพื่อประเมินประสิทธิภาพ ผลข้างเคียง และปัจจัยที่มีอิทธิพลต่อผลของการรักษาด้วยวิธีการฉีดยา triamcinolone เข้าไปในเนื้องอก hemangioma ที่มีขนาดที่แตกต่างกันและอยู่ในตำแหน่งที่แตกต่างกัน วิเคราะห์หาช่วงอายุที่เหมาะสมที่สุดในการเริ่มรักษาและหาระยะห่างของการฉีดยาที่เหมาะสมสำหรับผู้ป่วย*

วัสดุและวิธีการ: *ศึกษาย้อนหลังในผู้ป่วย 160 รายที่มีเนื้องอก hemangioma และได้รับการรักษา ด้วยวิธีการฉีดยา triamcinolone ในตำแหน่งเนื้องอก ตั้งแต่อายุ 1 เดือนจนถึง 15 ปี ผู้ป่วยทั้งหมดได้รับการรักษาโดยผู้นิพนธ์ในสถาบันสุขภาพเด็กแห่งชาติมหาราชินีตั้งแต่ มีนาคม พ.ศ. 2538 ถึง มีนาคม พ.ศ. 2551 การศึกษานี้ได้จากการเก็บข้อมูลจากการซักประวัติและตรวจร่างกายของผู้ป่วยโดยผู้นิพนธ์ ประวัติการรักษาที่บันทึกในเวชระเบียน ภาพถ่ายและการสอบถามข้อมูลทางโทรศัพท์ ข้อมูลที่ได้ทั้งหมดได้นำมาวิเคราะห์โดยวิธีทางสถิติตามมาตรฐานสากล ขนาดของเนื้องอกได้ถูกแบ่งออกเป็น 3 ขนาด คือ ขนาดเล็ก (> 0-3 ซม.), ขนาดกลาง (> 3-6 ซม.), และขนาดใหญ่ (> 6-9 ซม.) ข้อบ่งชี้ในการรักษาคือ ก้อนที่มีขนาดโตขึ้นอย่างรวดเร็ว, ก้อนที่บริเวณรอบดวงตาซึ่งทำให้เกิดปัญหาต่อการมองเห็น ก้อนที่มีปัญหาเลือดออก ก้อนที่มีปัญหาแตกเป็นแผล และก้อนที่อาจจะทำให้เกิดปัญหาแผลเป็นจนผู้ป่วยและครอบครัวเกิดความกังวล ขนาดยา triamcinolone ที่ใช้ฉีดคือ 1-2 มิลลิกรัมต่อกิโลกรัมของน้ำหนักของผู้ป่วย (สูงสุดไม่เกิน 60 มิลลิกรัม) ระยะห่างของการฉีดยามีความแตกต่างกันตั้งแต่ 4 สัปดาห์ จนถึง 12 สัปดาห์ ผู้ป่วยส่วนใหญ่ได้รับการตรวจและติดตามผลที่ห้องตรวจผู้ป่วยนอกทุกเดือนเป็นเวลาอย่างน้อย 14 เดือน ระยะเวลาเฉลี่ยในการติดตามผลคือ 3.6 ปี (ตั้งแต่ 14 เดือน ถึง 12 ปี)*

ผลการศึกษา: *ผู้ป่วยที่ได้รับการรักษาด้วยวิธีนี้จำนวน 160 ราย แบ่งเป็น เด็กหญิง 111 ราย และเด็กชาย 49 ราย ค่าเฉลี่ยของอายุขณะเริ่มฉีดยาครั้งแรกคือ 16.1 เดือน โดยมีความแตกต่างกันตั้งแต่ 2 เดือนถึง 9 ปี จำนวนของการฉีดยาแตกต่างกันไปตั้งแต่ 1-12 ครั้ง โดยมีค่าเฉลี่ย 5.7 ครั้ง ผลการตอบสนองโดยรวม 90% (ดีมาก 70% และดี 20%) พบว่าผลการรักษาดีที่สุดในกลุ่มผู้ป่วยที่ได้รับการรักษาเมื่ออายุน้อยกว่า 1 ปี (ดีมาก 77.8%, ดี 15.7%) และเนื้องอกในตำแหน่ง parotid gland (ดีมาก 93.1%, และดี 6.9%) นอกจากนี้ยังพบว่าขนาดของก้อน และระยะห่างของการรักษาไม่มีผลทำให้ผลของการรักษามีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ*

สรุป: *การรักษาเนื้องอก hemangiomas โดยการฉีดยา triamcinolone ที่ตำแหน่งของก้อน ถือเป็นวิธีการรักษาที่มีผลข้างเคียงน้อยและมีประสิทธิภาพสำหรับ hemangiomas ที่โตขึ้นอย่างรวดเร็ว*