Therapeutic management of skin hemangiomas in children

Abordagem terapêutica dos hemangiomas cutâneos na infância

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Abstract: BACKGROUND: Hemangiomas are benign, self-involuting tumors of endothelial cells that are common in childhood.
OBJECTIVES: To evaluate the treatment of 122 patients with skin hemangiomas treated at a teaching hospital in Brasilia, Brazil between March 2000 and December 2006.
MATERIAL AND METHODS: Data were collected from the patients' medical records and questionnaires were applied to the children's parents. Variables analyzed were: gender, pre- and perinatal factors, clinical characteristics of the lesions, type of treatment and outcome.
RESULTS: A male-to-female ratio of 1.5:1 was found. In 42 patients, hemangiomas were superficial, while in 13 cases they were deep and in 67 patients lesions were mixed. In 7 patients, the lesions were associated with syndromes. In 79 patients, hemangiomas were in the cephalic region. Of the 122 patients, 98 were submitted to one single treatment, while 24 required multiple forms of treatment. In the first group, expectant management was the conduct in 38 patients, compression in 3 cases, systemic corticotherapy in 18 patients, intralesional corticotherapy in 13, topical steroids in 4 cases, conventional surgery in 12 patients, cryosurgery in 7, pulsed light in one case and imiquimod in 2 patients. In the second group of 24 patients submitted to multiple treatment modalities, 15 required two types of treatment and 9 needed three or more.
CONCLUSIONS: The data obtained in this study were in agreement with results in the literature with respect to gender and the site of the lesions. The incidence of hemangiomas present at birth was higher than rates published in the literature. The therapeutical results obtained were comparable with data from other published studies. Identification of hemangiomas that require treatment, as well as the right moment for intervention and the best therapeutic option for each case, are factors that need to be taken into consideration.
Keywords: corticosteroids; combined therapy; cryosurgery; outcome of therapeutic interventions; general surgery; hemangioma; therapeutics

Resumo: FUNDAMENTOS: Hemangioma é um tumor benigno de células endoteliais comum na infância e de involução espontânea. OBJETIVO: Avaliar os tratamentos utilizados em 122 pacientes com hemangiomas cutâneos, tratados no Hospital Universitário de Brasília, de março de 2000 a dezembro de 2006.
MÉTODOS: Utilizou-se coleta de dados em prontuários e aplicação de questionários aos pais. Foram analisados gênero, fatores pré-natais e perinatais, características clínicas, tipo de tratamento e resultados.
RESULTADOS: A razão de sexo (F: M) foi de 1,5:1. 42, em pacientes que apresentavam hemangiomas superficiais, 13 profundos e 67 mistos; em 7 pacientes, havia associação com síndromes. Em 79 pacientes, localizavam-se no polo cefálico. Já em 98/122 dos pacientes, foram submetidos a tratamento único e 24/122 a múltiplos. No primeiro grupo, foi utilizada conduta expectante em 38 pacientes, compressão em 3, corticoide sistêmico em 18, corticoide intralesional em 13, corticoide tópico em 4, cirurgia convencional em 12, criocirurgia em 7, luz pulsada em 1 e imiquimod em 2. No segundo grupo, 15 fizeram 2 tipos de tratamentos e 9 necessitaram de 3 ou mais tratamentos.
CONCLUSÃO: Os dados obtidos concordam com a literatura mundial, quanto a sexo e localização da lesão. A incidência de hemangiomas presentes ao nascimento foi maior que em outras publicações. Os resultados terapêuticos obtidos foram comparáveis aos publicados na literatura. A identificação dos hemangiomas que necessitam de tratamento, em que momento adequado para intervenção e a melhor opção terapêutica devem ser considerados.
Palavras-chave: Avaliação de resultado de intervenções terapêuticas; Cirurgia geral, Corticosteroides; Criocirurgia; Hemangioma; Terapêutica; Terapia combinada.

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INTRODUCTION

Hemangiomas are benign tumors composed of endothelial cells and are common in infancy. They have a natural history of rapid growth during the first few months of life, followed by a slow involutive phase until partial or complete regression of the lesion. [1]

In the past, the term *hemangioma* was used in a broader, more indiscriminate sense. Currently, it is used to describe a specific group of vascular tumors that appear in infancy and have distinct clinical and histopathological characteristics, progression and prognosis. Hemangiomas must be differentiated from vascular malformations. The latter are present at birth, grow in proportion to the growth of the child and are histologically defined by the presence of flattened endothelial cells. [2] On the other hand, vascular tumors, which include hemangiomas of infancy, are the result of vascular proliferation. [3] In a small minority of patients, there may be an association between vascular tumors and vascular malformations. [4]

Diagnosis of hemangiomas is based on clinical history and clinical examination in 95% of cases. [1,3] Its pathogenesis has yet to be fully clarified; however, studies suggest a dysregulation in vascular homeostasis due to an error in development occurring in the first trimester of pregnancy. [4,5]

Around 30-50% of newborn infants present with a precursory mark at birth. [3] The growth phase of the hemangioma occurs in the first few weeks of life, reaching an apex between the third and sixth months of life; however, growth may continue until the child reaches 18-24 months. Later, it enters a quiescent phase, which persists for some months. The phase of slow involution begins between the 12th and 18th months of life. Complete regression occurs at a rate of 10% per year, 50% of hemangiomas regressing within a five-year period. Hemangiomas that do not involute by the sixth year of life will develop residual abnormalities, the most common of which are telangiectasias, atrophic wrinkling, yellowish discoloration, redundant skin, scarring and alopecia. [3]

Hemangiomas occur in 1.1 – 2.6% of Caucasian newborns, this prevalence rate being lower in black and Japanese infants (0.8%). According to studies carried out in Brazil, the incidence here is of 3-4 cases in every 100 liveborn infants. There is a marked predominance of females, a tendency for higher rates in light skinned infants and a high incidence in premature babies, particularly those with a birthweight of less than 1,500 grams. More than half of all hemangiomas involve the head region. The anatomical site of the lesion is the most significant factor in determining the probability of complications, [1,6] the most common of which are ulcerations, congestive heart failure, hypothyroidism, visual, hearing and breathing disorders and disfigurement. [7]

Hemangiomas may be classified clinically as superficial, deep and mixed or combined. Superficial hemangiomas are situated in the superficial dermis, while deep hemangiomas are in the reticular and/or subcutaneous dermis and the combined form has both a superficial and a deep component (Figure 1). Although the majority of cases require only stringent follow-up, specific treatment is necessary in 15% of patients in order to minimize future complications. [3] Various therapeutic modalities have been described in the literature for the treatment of hemangiomas; however, none has been shown to be completely effective in all cases (Figure 1).

According to the American Academy of Dermatology, the goals in the management of hemangiomas are to prevent or reverse the complication of alarming hemangiomas, to prevent permanent disfigurement, minimize psychosocial stress for patients and relatives, avoid aggressive and potentially unsightly procedures and prevent or adequately treat ulceration, thereby minimizing scarring, infections and pain. [1]

Expectant therapy or active non-intervention has always been the most widely used form of management, respecting the natural course of the hemangioma, which is benign and self-limiting. Periorificial location, extensive hemangiomas with a risk of coagulopathy or congestive heart failure and hemangiomas that may result in deformities should be treated.

Systemic corticosteroids constitute the most common form of therapy in severe cases. Their principal effect is to halt growth and, if possible, induce regression of the lesion, possibly by inhibiting angiogenesis and inducing apoptosis. [8] Prednisone and prednisolone are the most commonly used oral drugs and doses may vary from 2 to 5 mg/kg/day. Side effects have

Figure 1: Combined hemangioma in the right genian region

been described previously and are generally transitory. [9] Intravenous methylprednisolone pulse therapy resulted in a significant reduction in the risk of eye complications in patients with periocular hemangiomas. [10]

A high-potency topical corticoid has been tested for the treatment of superficial hemangiomas with good results. [11] Response is generally poorer than that observed with intralesional corticosteroid therapy and side effects may occur. [12]

Intralesional corticosteroid therapy is used principally in cases of periocular hemangiomas or in smaller lesions; however, its use is controversial because of possibly severe side effects. [3,13]

Interferon is indicated for the treatment of alarming hemangiomas when there is a risk of death and the tumor fails to respond to treatment with oral corticoids. Response may be slower compared to corticosteroid therapy, its angiogenic effect having been shown to be effective and to result in a response of 50% over a mean treatment period of 7.8 months. [9] Various side effects have been registered and there is an additional risk of neurotoxicity. [14]

Antineoplastic agents have been used in rare cases in which the hemangioma fails to respond to treatment with corticosteroids or interferon. [3] Good clinical response has been reported with moderate, transitory side effects in less than 50% of cases.

Early surgical intervention is used in cases in which the condition has the potential to affect patients' self-esteem such as hemangiomas at the tip of the nose, pedunculated lesions and lesions on the eyelid that fail to respond to clinical treatment. [15] The surgical technique traditionally used is lenticular excision, with circular excision constituting an alternative technique. [16]

Cryosurgery is more effective when performed in older children and in small lesions. [17] The most common complications are atrophy, scarring and changes in pigmentation. [15]

Sclerotherapy is indicated for some deep hemangiomas. Some of the sclerosing agents used include ethanol, polidocanol and others. Complications are not uncommon and include skin necrosis and peripheral nerve paralysis. [15,18]

New forms of therapy have been tested, among them a topical immunomodulator, which was evaluated with good results in superficial hemangiomas in the proliferative phase. [19,20]

Different types of laser may be used in the management of hemangiomas, including argon, CO2, Nd:YAG and, more recently, long-pulsed tunable dye laser (LPTDL). [15]

Embolization is seldom used due to the risk of particle migration. In complicated vascular tumors this technique may be used prior to surgical resection. [15,21]

Radiotherapy has been practically abandoned because of long term sequelae. [13] Vascular ligation may be considered with caution in cases of arteriovenous fistulae and when there is intense bleeding. [6] Compression therapy is another therapeutic option; however, disadvantages include possible ulceration and the discomfort provoked by pressure on the site. [15]

The objective of this study was to analyze the various forms of therapy used to treat hemangiomas in pediatric patients receiving care at this teaching hospital between March 2000 and December 2006.

MATERIAL AND METHODS

Patients aged 0-15 years, who were receiving treatment for hemangiomas of the skin or mucous membranes at the surgery and dermatology pediatric departments of the teaching hospital of the University of Brasília between March 2000 and December 2006, were included in this study.

Data were collected by reviewing patients' charts at the teaching hospital and by applying a questionnaire to the children's parents or guardians during a consultation. Clinical and, if necessary, laboratory evaluation was performed and photographic documentation of the lesion was made. The questionnaire was elaborated to collect data on the patient's identification and aspects related to complications of the pregnancy and childbirth, clinical characteristics of the hemangioma, the type of treatment used and the evaluation of the parent or guardian and of the investigators with respect to post-treatment outcome: complete cure, partial cure or no change. Complete cure was defined as a reduction of over 80% in the size, consistency or color of the lesion. Partial cure was defined as a reduction of 50-79% with respect to these same parameters and no change implied that the characteristics of the lesion remained the same as prior to treatment. This was a retrospective, clinical, analytical cohort, the variables consisting of the various forms of treatment (independent variable) and outcome (dependent variable: complete cure, partial cure or no change).

The Statistical Package for the Social Sciences (SPSS), version 13.0 (2004) was used for the entire data analysis. To evaluate the association between the variables studied, the chi-square test was used and the odds ratios were calculated. P-values <0.05 were considered statistically significant.

RESULTS

A total of 122 cases were analyzed, 60.7% of which were female (74/122) and 39.3% male (48/122), constituting a female/male ratio of 1.5 to 1.

Seventeen of the 122 mothers (13.9%) associated the presence of the hemangioma with certain prenatal factors such as a threatened miscarriage and/or bleeding in the first trimester of pregnancy. Eighteen

of the patients in the study (14.8%) were born prematurely compared to 104/122 (85.2%) who were born at term. The premature/full term ratio was 1 to 5.7.

Of the 122 patients in the study, 101 (82.8%) had precursor lesions or initial hemangiomas shortly after birth (within 30 days), while in 21 patients (17.2%), the parents noticed the lesions four weeks following the birth. Growth of the lesion was perceived in 103 patients (84.4%), while in 19 (15.6%) the lesions remained unchanged. One hundred and eleven of the 122 patients (91%) had single lesions, while in the remaining eleven patients (9%) lesions were multiple.

In 42 patients (34.4%), the hemangiomas were classified as superficial, whereas in 13 cases (10.7%) they were considered deep and in 67 patients (54.9%) they were combined. With respect to the site of the lesions, 79 were located on the head (64.8%), 23 on the trunk (18.9%), 18 on the limbs (14.8%) and 8 on the perineum (6.6%). Lesions <3 cm in diameter were classified as small, those between 3 and 5 cm as medium and those >5 cm as large. In 64 patients (52.5%), the hemangiomas were considered small, in 33 (27%) medium and in 25 cases (20.5%) large. Ulceration and bleeding were present in 12 patients (9.8%). In 7 patients (5.7%), the hemangiomas were associated with syndromes: PHACE syndrome, Sturge-Weber syndrome, Dandy-Walker syndrome and Kasabach-Merritt syndrome.

Ninety-eight of the 122 patients were submitted to a single form of treatment, while 24 required multiple forms of therapy. In the group of patients submitted to a single form of therapy, treatment modalities consisted of: expectant management in 38 patients (38.8%), compression in 3 cases (3.1%), systemic corticosteroids in 18 patients (18.4%), intralesional corticosteroids in 13 patients (13.3%), topical corticosteroids in 4 cases (4.1%), conventional surgery in 12 patients (12.2%), cryosurgery in 7 patients (7.1%), laser and/or pulsed light therapy in 1 patient (1%) and imiquimod in 2 patients (2%).

Of the 24 patients submitted to various forms of therapy, 15 underwent two types of treatment, whereas 9 required three or more forms of treatment. Seven patients (29.2%) used intralesional corticosteroids and later underwent conventional surgery, 6 patients (25%) used oral corticosteroids followed by conventional surgery, 1 patient (4.2%) was submitted to oral and intralesional corticosteroids and 1 patient (4.2%) was treated with topical corticosteroids and cryosurgery, while 9 (37.5%) patients required three or more forms of treatment. In this group, the lesions were predominantly situated on the head.

Complete cure was reported by the parents of 36 patients (29.5%) and partial cure in 78 cases (63.9%); however, in 8 patients (6.6%) no change occurred in the lesion following treatment. In these 8 patients, the therapeutic option had been expectant management; however, these patients were later diagnosed with a port-wine stain; therefore, they were not taken into consideration in the data analysis.

Consequently, of the 90 patients who underwent one single treatment for hemangioma, 28 (31.2%) were completely cured, while 62 (68.8%) were partially cured. Thirty of these patients had been submitted to expectant management, 5 (16.7%) achieving a complete cure and 25 (83.3%) partial cure (Figure 2). Compression was used in three patients, leading to a complete cure in one case (33.3%) and partial cure in the other two (66.7%) (Figure 3). Oral corticosteroids were used by 18 patients, 5 of whom achieved complete cure (27.8%), while 13 were partially cured (72.2%) (Figure 4). Intralesional corticosteroids were used in 13 cases, complete cure being reached in one of these patients (7.7%), while the remaining 12 patients were partially cured (92.3%)

Figure 2: Treated with expectant management. Left retroauricular hemangioma. Involution of the lesion in 22 months, resulting in complete cure

Figure 3: Compression therapy. Hemangioma of the left breast. Complete cure

(Figure 5). Topical corticosteroids were used in 4 patients, partial cure being obtained in three cases and complete cure in the remaining patient (Figure 6). Conventional surgery was carried out in 12 cases and all these patients were completely cured of the lesions with no recurrence of the hemangioma at the scar borders (Figure 7). Cryosurgery was performed in 7 patients, partial cure being achieved in five cases and complete cure in two (Figure 8). One patient was submitted to pulsed light therapy, which resulted in partial cure; however, the treatment had to be stopped because of pain. Topical imiquimod cream was used in two patients and response was good in both cases, with complete cure in one case and partial cure in the other (Figure 9).

Of the 24 patients submitted to multiple treatment modalities, 12 (50%) were completely cured and 12 (50%) were partially cured. Seven were initially submitted to intralesional corticotherapy and later to conventional surgery, complete cure being achieved in five cases (71.4%) and partial cure in two (28.6%). Six patients used oral corticosteroids and were later submitted to conventional surgery, total cure being obtained in four cases (66.7%) and partial cure in two cases (33.3%) (Figure 10). One patient used both oral and intralesional corticosteroids and was completely cured, while one patient used topical corticosteroids and was later submitted to cryosurgery. In this case, the patient achieved partial cure.

Nine patients required three or more forms of treatment, complete cure being achieved in two of these cases (22.2%) and partial cure in seven (77.8%).

No statistically significant correlations were found when the variables concerning the forms of treatment were crossed with treatment outcome. The association between expectant management and complete and partial cure resulted in an odds ratio (OR) of 2.37; however, the 95% confidence interval (95%CI) was 0.769 – 6.986 with a p-value of 0.129, indicating that there was no relationship of causality. Likewise, no correlations were found in this sample with respect to any of the treatment modalities: compression, systemic corticosteroids, intralesional corticosteroids, cryosurgery or imiquimod. The limited sample of patients who were submitted to one single form of therapy (n=90) affected the results, since the patients were distributed among the different types of treatment, resulting in a small sample size for each individual mode of therapy. With respect to

Figure 4: Oral corticosteroid therapy. Hemangioma in the chin region. Regression of the lesion in a 6-month period, resulting in complete cure

Figure 5: Intralesional corticosteroid therapy. Hemangioma in the right frontal region. Regression of the lesion after four applications of the medication, resulting in complete cure.

Figure 6: Topical corticosteroid therapy. Hemangioma in the thigh region. Regression of the lesion with complete cure

laser/pulsed light therapy, it was impossible to calculate the OR, p-value or 95%CI, since the sample consisted of one single patient in whom partial cure of the lesion (100% partial cure) was achieved. Evaluation of conventional surgery revealed a statistically significant association between this form of treatment and successful outcome, with a p-value close to zero; however there was no confidence interval, since complete cure was achieved in all cases (100% total cure).

DISCUSSION

There was a female-to-male ratio of 1.54 to 1 in the patients in this study, which is in agreement with current literature in which the predominance of hemangiomas in females has been reported; however, the ratio in the present study is lower than those previously reported. [1,3,6]

Despite the significant association that has been shown between invasive procedures during pregnancy such as chorionic villus sampling and the appearance of hemangiomas, [22] this was not confirmed in the present study, since none of the mothers in this sample had been submitted to this procedure.

The data related to a threatened abortion and/or bleeding in the first trimester of pregnancy are important due to the risk of partial placental abruption and a probable association with hemangioma. In the present study, 17 cases of this occurrence were reported (13.9%).

The predominance of hemangiomas in premature infants is well-documented, these being found in 23-30% of premature newborns with a birthweight < 1,000 grams and in 15% of newborns weighing between 1,000 and 1,500 grams. In accordance with the literature, the ratio of hemangiomas in premature newborn infants of less than 1 kg is 4 for every one full-term infant. [1-3] In this sample, prematurity was reported in 18 cases (14.8%), resulting in a preterm-to-full-term ratio of 1 to 5.7, in contradiction with figures reported in the international literature, although Goldenberg et al. (2001) reported that 95.8% of their patients were born at term. [24] The low survival rate of extremely premature (< 1,000 grams) newborn infants in public hospitals collaborates towards these data.

In the international literature, precursory lesions are reported to be present in 30-50% of patients [3], the lesion arising within one month of birth in 77.0 - 88.7% of cases, [6,25] while the incidence of hemangiomas or precursory signs at birth is 56.8% [24]. In the present study, the percentage of lesions appearing prior to one month of life was higher (82.8%). This higher incidence of precursory lesions may be associated with the fact that the study was conducted in a referral hospital, where cases

Figure 7: Conventional surgery. Hemangioma on the left side of the nose. Regression of the lesion with complete cure

Figure 8: Treatment with cryosurgery. Hemangioma on the back of the left hand. Regression of the lesion after three sessions, resulting in complete cure

of greater complexity are received.

The lesion increased in size following birth in 103 patients (84.4%), while in 19 cases (15.6%) it remained unchanged. Campos (2000) reported rapid growth of the lesion in 89.5% of the cases evaluated by this investigator. [6]

Single lesions occurred in 111 patients (91%) and multiple lesions in 11 (9%), which is in agreement with reports in the literature of single lesions in 80-85% of patients and multiple lesions in 15-30%. [1,3,25]

There was a predominance of combined hemangiomas in this study. Of the 122 patients in the sample, hemangiomas were superficial in 34.4%, combined in 54.9% and deep in 10.7%. These data differ from reports in the international literature in which studies have found superficial lesions in 50-60% of patients, combined lesions in 25-35% and deep lesions in 15% of patients. [23] In studies carried out in Brazil, a predominance of superficial lesions has been reported (95.8%).[6] Goldenberg (2001) reported superficial lesions in 34.1% of cases, deep lesions in 27.3% and combined lesions in 38.6% of patients. Dutra (2003) reported superficial or combined lesions in 63.9% of cases and deep lesions in 11.2%. [6,24,26] This divergence in data is due to the fact that the majority of superficial lesions involute spontaneously within a shorter time and are not, therefore, referred to hospitals such as this teaching institute, which deal with more severe cases.

Evaluation of the site of the hemangiomas showed that 79 were located on the head (64.8%), 23 on the trunk (18.9%), 18 on the limbs (14.8%) and 8 on the perineum (6.6%). Some patients had multiple hemangiomas. The data found in the present study are in agreement with reports in the literature in which hemangiomas are located on the head in 60% of patients, on the trunk in 25% and in the extremities in 15% of cases. [1] In studies carried out in Brazil, hemangiomas were situated on the head in 71.6% of cases, on the trunk in 20.3%, on the limbs in 20%, on the perineum in 4.3% and on the viscera in 0.7%. [6]

Small hemangiomas (< 3 cm) were found in 64 patients (52.5%), medium-sized lesions (3-5 cm) in 33 patients (27%) and large hemangiomas (> 5 cm) in 25 patients (20.5%). To the best of our knowledge, there are no data in the international literature evaluating the size of hemangiomas; however, a paper published in Brazil on a study conducted by Campos (2000) reported that 64% of lesions were < 5 cm, while 35.2% of lesions were > 5 cm. [6]

Ulceration is the most common complication, occurring in 5-13% of cases according to the interna-

Figure 9: Treatment with imiquimod. Hemangioma on the left lower eyelid. Regression of the lesion after two months of treatment (twice weekly for five weeks), resulting in complete cure

Figure 10: Multiple therapy: oral corticosteroids and conventional surgery. Regression of the lesion with complete cure albeit with unsightly scar

tional literature. In Brazil, reports in the literature confirm the occurrence of ulceration in 35.9% of cases, while bleeding occurs in 22.6% of patients with hemangiomas. [6] In agreement with the international literature, ulceration and bleeding occurred in 9.8% of the patients evaluated in the present study.

This study encountered an association between hemangiomas and syndromes in 5.7% of patients. This finding is in agreement with a report by Campos (2000), in which hemangioma-associated syndromes were present in 4.9% of cases. [6] Dutra (2003) conducted a study over a 15-year period in patients with vascular lesions of the orbital region and reported an association with syndromes in 8/169 of the patients evaluated (PHACES, Dandy-Walker, Kasabach-Merritt and Proteus syndromes). [26]

The data from the present study are in agreement with those reported in the literature with respect to gender, pre- and perinatal factors and characteristics such as the presence of the lesion at birth, its growth and the number of lesions. No association was found between pre- and perinatal variables or the presence of ulceration and bleeding and the presence of associated syndromes and post-treatment outcome.

In the group of patients who used only one form of treatment (n=98), that treatment consisted of expectant management in 38.8% of cases, while 61.2% required some form of pharmaceutical or surgical intervention. According to the international literature only 10-20% of hemangiomas require clinical or surgical treatment, expectant management being the conduct adopted in the remaining 80%. [3]

Of the 122 patients, complete cure was achieved in 29.5% and partial cure in 63.9%, while 6.6% failed to respond to treatment. In a study conducted by Dutra (2003), complete cure was found in 59.5% of patients and partial cure in 40.8%. [8] Campos (2000) reported complete and/or partial cure in 84.3% of patients and absence of response to treatment in 13.4% of patients in this study. [6]

The fact that in the present study, 38.8% of patients were treated with expectant management is in agreement with other studies in which expectant management was the mode of conduct in 34.9% and 36.4% of cases. [24,26] Della Nina et al. (2006) reported expectant management in 75% of cases, in which 57.5% consisted of superficial lesions and 17.5% deep lesions. These investigators reported complete cure in 40% of the patients treated with expectant management. [25] The difference in the percentage of patients treated with expectant management in the present study in relation to figures reported in the internation-

al literature is due to a bias in which the patients in the present sample do not reflect the situation of the general population, since they were referred for tertiary care as a result of the more complex pathology in their particular cases, which required clinical or surgical intervention. Fewer cases of complete cure were found among the patients whose treatment consisted of expectant management (5/30), probably because the lesions were still regressing. It is estimated that 90% of hemangiomas involute for up to 9 years. [13] The patients in whom cure was complete had small, mostly superficial lesions that involuted completely.

A retrospective study carried out in 543 patients with hemangiomas found that 15.8% of the patients had used systemic treatments (corticosteroids or interferon), while 17.3% were submitted to conventional surgery. [6] In the present study, 22.1% of the patients used oral corticosteroids and, of these, 27.8% were completely cured. Della Nina et al. (2006) reported that 17.5% of their patients were treated with oral corticosteroids. Oral corticosteroids are the therapy of choice for hemangiomas when there is a risk of complications or a potential for disfigurement. [27] Dutra (2003) reported systemic clinical treatment in 21.9% of patients and clinical treatment followed by surgery in 20.7% of patients. [26]

The use of intralesional corticosteroids for hemangiomas is controversial because of the risk of side effects. [3] In the present sample, 13 patients (13.3%) were submitted to this form of treatment, which resulted in partial cure in 92.3% of cases, the majority of which consisted of deep or combined lesions, and complete cure of the lesions in 7.7% of cases. The patients were submitted to 3 or 4 applications at 4-6 week intervals. One patient suffered ecchymosis following the application; however, this resolved spontaneously. According to Chen et al. (2000), in 85% of the patients treated with intralesional corticosteroids a reduction of 50% was achieved in the volume of the lesion. [28]

The use of topical corticotherapy is also controversial in the literature and some authors have reported significant side effects and poorer efficacy when this form of treatment is used compared with intralesional corticosteroids. [12] In the present study, topical corticosteroids were used in four patients (4.1%), resulting in partial cure in three cases and complete cure in the remaining patient. Three patients had ulceration with bleeding in lesions located in the perineum and all three used the medication once a day for three weeks, often in association with a healing cream. A recent study published in the literature reported a good response with topical corticosteroids in 74% of patients. [11]

Compression therapy was used in three patients (3.1%), resulting in partial cure in 66% and complete cure in 33.3%, probably as a function of the depth of the lesion; however, one case of a combined lesion resulted in complete cure. In the literature, compression therapy is more often used for vascular lesions on the extremities. [15]

In this present sample, cryosurgery was used in seven patients (7.1%), resulting in partial cure in five. Complete cure was achieved in a patient with a lesion on the labia majora and in another patient with a lesion on an extremity, albeit with mild transitory hypochromia. The patients were submitted to two or three sessions using a spray or contact technique with a freezing time that ranged from 10 to 30 seconds. Della Nina et al. (2006) reported cryosurgery in 7.5% of patients in their study. [25] Other studies have reported efficacy rates in superficial lesions that are close to those achieved with pulsed dye laser. [15,17]

Intense pulsed light was applied to one patient over three sessions with an interval of four weeks between sessions. The patient abandoned treatment due to the pain and reported partial cure. None of the patients was given laser therapy, since this resource was not available at this hospital. In the literature, the use of laser and pulsed light for superficial lesions has been associated with considerable success rates. [29]

The use of imiquimod is a promising therapeutic option, principally for small to medium-sized lesions that are not excessively deep. [19,20] The two patients (2%) treated with this medication achieved a fast response that resulted in partial cure in the case of the patient with a paranasal lesion and complete cure in the patient with a lesion on his lower eyelid. Local side effects such as inflammation and erythema reported in the literature were also found in this study and required interruption of the medication for 15 days. A study carried out by Ho et al. (2007) reported complete cure in 4/18 patients with superficial hemangiomas and partial cure in the cases of combined hemangiomas, showing a statistically significant difference between the results achieved in the case of superficial lesions compared to those with combined or deep lesions. [30]

Conventional surgery is generally performed on pedunculated lesions, lesions located on the eyelids, nose, periorificial sites or those unresponsive to the clinical treatment prescribed. [11] In the present study, 12 of the patients (12.2%) who underwent a single form of treatment (n=98) were submitted to surgery and obtained complete cure of the lesions. Studies have described conventional surgery for the treatment of 17.3% to 27.2% of patients with hemangioma. [2,6] In the present study, 16.3% of all the patients (n=122) were submitted to conventional surgery. Dutra (2003) reported surgical intervention following clinical treatment in 20.7% and conventional surgery in 22.2% of patients. [26]

Hemangiomas on the tip of the nose represent a challenge. The treatment of choice in these cases is

generally conventional surgery. In the present study, four patients with nasal hemangiomas were analyzed, two of whom were submitted to conventional surgery resulting in complete cure. The third patient was submitted to oral corticosteroids and the fourth to intralesional corticosteroids, achieving good responses in both cases (partial cure).

In the group of patients submitted to multiple forms of treatment (n=24), 15 (62.5%) required two forms of treatment, while 9 patients (37.5%) required three or more forms of treatment. The modalities used in the first subgroup of multiple forms of treatment were: conventional surgery associated with intralesional corticosteroid infiltration, conventional surgery associated with oral corticosteroids, oral corticosteroids associated with intralesional corticosteroid infiltration and topical corticosteroids associated with cryosurgery. Conventional surgery always took place after the initial treatment except for one patient. In the subgroup of patients submitted to three or more forms of treatment, there was a wide variety of therapeutic combinations. Notably, 8 of these 9 patients were submitted to conventional surgery and all used oral corticosteroids. The patients who were submitted to two or more forms of treatment generally had more complex lesions or the excessive concern of their parents induced the physician to attempt the association of more forms of treatment.

Other forms of treatment such as embolization, sclerotherapy, antineoplastic drugs and interferon were not used in this sample during the study period.

The study reinforces the data reported in the literature with respect to gender, the clinical characteristics of the lesions and post-treatment outcome, and highlights differences related to the percentage of premature infants and of lesions present at birth. The possible association of threatened miscarriage and/or bleeding in the first trimester of pregnancy with hemangiomas represents a new finding that has not previously been reported in the literature and which is in accordance with similar findings of a higher incidence of hemangiomas in the children of mothers submitted to chorionic villus sampling in the first trimester of pregnancy.

The seven-year follow-up enabled data to be collected that have seldom been reported in the literature such as the incidence of threatened miscarriage, the greater number of lesions present soon after birth and the higher rate of mixed or combined lesions. Approximately one-third of the patients were followed-up with expectant management, which accompanied the natural involution of the lesion. Expectant management continues to be the most common measure adopted by many specialists. Interventions are more common in complex cases due to the anatomical and/or functional risks that may occur. In the pediatric population, it is very important that the measures adopted be definitive and effective in reducing morbidity from a psychological, anatomical and functional point of view in these children. Individualized management of each patient is vital in order to achieve satisfactory outcome, minimizing anatomical and functional sequelae and reducing the effect of the pathology on the patient's self-esteem and in his/her social interaction with the family.

The present study does not represent the most appropriate model for evaluating the association of the various types of treatment used in relation to cure; however, it is a starting point for other studies that should contribute towards evaluating the most adequate forms of treatment for hemangiomas of infancy.

CONCLUSIONS

The management of hemangiomas is difficult and controversial, with a wide clinical spectrum and varying severity. The lack of prospective, treatment-related studies is compounded by a scarcity of evidence-based studies.

The results of this study are in agreement with reports in the literature regarding the gender of patients, the localization of the lesions, their number and dimensions, the presence of ulceration and the association of these lesions with syndromes.

The findings reported here on the percentage of lesions present at birth and the percentage of combined lesions are in conflict with data in the literature, where the rates of both of these factors are higher.

Pre- and perinatal factors were not associated with the presence of hemangiomas in this study and prematurity was not expressive.

Analysis of the treatment modalities used showed no statistically significant association between the forms of treatment and outcome, with the exception of conventional surgery, which yielded the best results with respect to achieving complete cure of the hemangioma.

Therapeutical response to cryosurgery and imiquimod was good.

Partial cure also represented an improvement in the lesions from a functional, anatomical and esthetical point of view. Some lesions evaluated as partially cured at the time of examination tend to progress to total involution, which reflects the efficacy of the treatment and confirms the good results obtained in this study.

The most adequate form of treatment depends on the case in question and each patient should be individually evaluated within the various contexts, identifying which hemangiomas require treatment, the most appropriate time for the intervention, the psychosocial implications of the tumor on the child and his/her family and the optimal therapeutic option, always evaluating the risks and benefits of the treatment. ❑

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