Childhood Bullous Pemphigoid: A Case Report and Literature Review

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Abstract
Bullous pemphigoid is a very rare dermatologic disorder in children. We report a 1-year and 9-month-old boy, who was diagnosed childhood bullous pemphigoid on the basis of clinical findings and confirmed by skin biopsy showing subepidermal blisters with dermal layer infiltrated with neutrophils, a unique histological finding. The result mimicked the histological findings of linear immunoglobulin A bullous disease. Direct immunofluorescence showed linear deposits of IgG and C3 at dermal-epidermal junction, similar to epidermolysis bullosa acquisita and bullous systemic lupus erythematosus. We suggested the differential diagnosis of subepidermal blisters should include linear immunoglobulin A bullous disease of childhood, epidermolysis bullosa acquisita and bullous systemic lupus erythematosus.

Keywords: Bullous pemphigoid; Childhood; Subepidermal blisters; Linear immunoglobulin A bullous disease; Epidermolysis bullosa acquisita

Abbreviation: BP: Bullous Pemphigoid; DIF: Direct Immunofluorescence; IIF: Indirect Immunofluorescence; BMZ: Basement Membrane Zone; LABD: Linear Immunoglobulin A Bullous Disease; EBA: Epidermolysis Bullosa Acquisita; SLE: Systemic Lupus Erythematosus

Introduction
Bullous pemphigoid (BP) is an autoimmune subepidermal blistering disorder which is induced by autoantibodies against the dermoepidermal junction of skin and adjacent mucous membrane. The elderly is mostly affected, and childhood bullous pemphigoid is rare. Lesions of childhood BP are large, tense bullae that can be found in all areas of body, including inner sides of the thigh, forearm, axillae, lower part of the abdomen, groin, palms and soles. Some patients may complain of pruritus. In addition, mucosal involvement is common in the pediatric population. Diagnosis, similar to that of adult, is based on clinical, histological, and immunopathological features. Classic histology reveals subepidermal blisters with dermal infiltration of predominantly eosinophils. Direct immunofluorescence (DIF) of skin biopsy of unblistered, perilesional skin (normal-looking skin) reveals linear deposition of IgG and/or complement C3 along the basement membrane zone (BMZ). Indirect immunofluorescence (IIF) shows presence of circulating IgG anti-basement membrane zone antibodies [1-4]. We report a case of childhood bullous pemphigoid whose skin biopsy showed subepidermal blisters with dermal layer infiltrated with neutrophils.

Case Report
A 1-year and 9-month-old boy, with history of atopic dermatitis, was referred to our service with complaint of multiple vesicles off and on over face, trunk, limbs and groin area for 2 months. According to his father’s statement, these skin lesions appeared in groin area first and extended to back and neck. Itchy sensation was also noted but no fever. Some of the lesions subsided spontaneously and some appeared at other sites. Two days ago, multiple bullae and vesicles developed on hands and feet (Figure 1). There was no similar symptoms within all areas of body, including inner sides of the thigh, forearm, axillae, lower part of the abdomen, groin, palms and soles. Diagnosis is based on clinical, histological, immunopathological features [1-3].
Specific criteria of childhood BP have been suggested to help early diagnosis:

1. Patients aged 18 years and younger with the clinical appearance of tense blisters on erythematous or normal skin with or without mucous membrane involvement and having subepidermal blisters with eosinophils, and

2. Linear deposits of IgG or C3 at the epidermal basement membrane zone on DIF, or circulating IgG anti–basement membrane zone autoantibodies on IIF[2].

The etiology of childhood BP is not clear, and possible causes reported include nonspecific maternal antibodies[5], primary autoimmune disease in infancy[6] and foreign antigen (e.g. infectious agents, drugs, and vaccines)[7]. Treatments include anti-inflammatory agents and immunosuppressants. Antibiotics will be used when secondary bacterial infection is found. Childhood BP usually has favorable prognosis [8].

The histopathology of BP shows subepidermal blister formation with eosinophils infiltration. DIF reveals the presence of linear deposition of IgG and/or C3 at dermoepidermal junction. Collagen XVII (BP180) and BP 230, the targeted antigen, are found in the hemidesmosome on the epidermal side above the type IV collagen (which is part of the basement membrane component within lamina densa) [9-12]. In our case, the histological examination revealed subepidermal blister with dense neutrophils and cells debris. DIF examination showed linear deposits of IgG and C3 at dermoepidermal junction. The result mimicked the histological findings of linear immunoglobulin A bullous disease (LABD) of childhood and was similar to the DIF of epidermolysis bullosa acquisita (EBA) and bullous systemic lupus erythematosus (bullous SLE).

LABD of childhood, one of the most common autoimmune bullous diseases in children, is a chronic bullous disease of IgA disease. The disease affects children before 5 years old of age. The lesions of this disease are clear, and/or hemorrhagic vesicles or bullae on skin. Histological examinations showed subepidermal blisters with neutrophils infiltration, though mononuclear cells and eosinophils may also be seen. DIF confirms the diagnosis. DIF of skin biopsy from perilesional skin showed linear deposition of IgA along dermoepidermal junction [2]. EBA is a chronic autoimmune subepidermal blistering disease, and is found rarely in childhood. The disease is characterized by circulating autoantibodies IgG against type VII collagen, a component of anchoring fibrils which bind the basement membrane to the underlying dermis. Concurrent disease has been reported in patient with EBA. The clinical presentation of EBA is skin fragility, blisters and dystrophic change. The treatment of EBA is usually not satisfactory. Some options such as azathioprine, dapsone, colchicine, corticosteroids, mycophenolate mofetil, and intravenous immunoglobulins (IVIG) have been reported [2,13]. Bullous SLE is an autoimmune disease with underlying diagnosis of SLE. The target antigen is also type VII collagen[14]. Skin biopsy is characterized by subepidermal blisters with predominantly neutrophils. DIF showed IgG deposition along the BMZ [2].
In our case, the DIF of perilesional skin showed linear deposits of IgG and C3 at dermoepidermal junction which is the gold standard diagnosis of bullous pemphigoid. Double immunofluorescence staining of DIF revealed C3 immune complex deposition above type IV collagen. The characteristic histochemical findings in the skin biopsy of our patient suggested a diagnosis of childhood BP.

We reviewed case reports of childhood bullous pemphigoid over the past ten years (Table 1). The age of all patients was all less than 18 years old. The involvement of lesions was generalized. The lesions in palms and soles were more common in childhood than adult and some cases had mucosa involvement. The associated disorders or possible trigger factors were varied. Six cases accepted vaccinations before disease developed. There was one case with history of inflammatory bowel disease, another with hyperimmunoglobulin E syndrome and the other with atopy. Histological findings found predominantly eosinophils, lymphocytes, neutrophils, and IgG, C3, IgA (faint).

| Reference | Age/Sex | Involvement | Associated disorders or possible trigger factors | Histology | Immunofluorescence | Treatment |
|-----------|---------|-------------|-----------------------------------------------|-----------|-------------------|-----------|
| [8]       | 7 y/M   | Vulval area | Vagina | None | Cell-free | IgG, C3 | Topical steroids |
| [16]      | 9m/F    | Wide spread, palms, soles | Vagina | None | eosinophils | IgG, C3 | Prednisolone (1mg/kg/day), sulfapyridine |
| [21]      | 3.5 m/M | Face, trunk, hands and feet | None | DTP* vaccine | Neutrophils | C3 | high-dose i.v. immunoglobulin |
| [17]      | 42m/F   | Not described | Present | IBF | Not described | Not described | Plasma exchange |
| [9]       | 5m/M    | Trunk, face, lower limbs | Present | None | eosinophils | IgG, C3, IgA (faint) | Prednisolone (2mg/kg/day) |
| [19]      | 5m/M    | Hands, feet, and trunk | None | None | eosinophils | IgG, C3, IgA (faint) | Prednisolone (1mg/kg/day) |
| [20]      | 12m/M   | Scalp, trunk, limbs, palms, soles | None | None | Not described | IgG, C3 | Dapsone (1mg/kg/day), Prednisolone (1mg/kg/day) |
| [18]      | 4m/F    | Abdomen, limbs, scalp, palms, soles | None | None | eosinophils | IgG, C3 | Prednisolone (1mg/kg/day) |
| [21]      | 15m/M   | Trunk, neck, limbs, face, palm, soles | Present | None | Lymphocytes, eosinophils | IgG, C3 | Prednisolone (1mg/kg/day) |
| [20]      | 10w/F   | Scalp, trunk, inner thighs | None | DTaP+/IPV+/Hib* vaccine | eosinophils | IgG, C3 | Prednisolone (2mg/kg/day) |
| [3]       | 6m/M    | Palms, soles, lower extremities, scalp and ear lobes | Present | Hyper-IgE syndrome | eosinophils | IgG, C3 | Prednisolone (1mg/kg/day), oral antibiotics |
| [21]      | 7y/M    | Glans penis | None | None | Lymphocytes, plasma cells and rare eosinophils | IgG, C3 | Corticosteroids |
| [22]      | 3y/F    | Trunk, extremities | None | VZV* vaccine | eosinophils | C3, weaker IgG, IgM | Prednisolone (2mg/kg/day), Dapsone (1mg/kg/day) |
| [23]      | 5n/F    | Trunk, extremities, hands and feet | None | DTP* vaccine | Lymphocytes, eosinophil | IgG, IgM, C3 | Topical steroids |
| [3]       | 5n/F    | Face, fingers, trunk, extremities, palm, soles | None | BCG vaccine | Lymphocytes, eosinophils | IgG | Topical steroids |
| [8]       | 16y/F   | >70% of her total body surface area | None | Atopy | eosinophils | NA | NA |
| [24]      | 21m/M   | Face, trunk, limbs, groin area, palm, soles | None | None | Neutrophils | IgG, C3 | Prednisolone (0.5mg/kg/day) |

Table 1: Summary of Childhood bullous pemphigoid case reports since 2003.

In our case, the DIF of perilesional skin showed linear deposits of IgG and C3 at dermoepidermal junction which is the gold standard diagnosis of bullous pemphigoid. Double immunofluorescence staining of DIF revealed C3 immune complex deposition above type IV collagen. The characteristic histochemical findings in the skin biopsy of our patient suggested a diagnosis of childhood BP.
although two cases were neutrophils predominant. DIF of all cases showed linear deposition of IgG and/or C3 at the dermoepidermal junction, except two cases with IgM deposition. The treatments almost were anti-inflammatory agents and immunosuppressants with or without topical agent. Only two cases were treated with high dose IVIG and plasma exchange.

Predominant neutrophils of subepidermal blisters in bullous pemphigoid are very rare histological findings. Lara Andrachuk[15] reported a case of a 59-year-old woman with bullous eruption, and the histologic examinations of her skin lesions showed subepidermal blisters with linear arrangement of neutrophils. He suggested that bullous pemphigoid should be considered in the differential diagnosis of neutrophil-rich subepidermal bullous disease with dermatitis herpetiform and LABO.

Conclusion

Childhood bullous pemphigoid is a rare disease. The diagnosis depends on the combinations of clinical history, histological findings, and immunofluorescence. Prognosis of childhood BP is good and the duration is often limited to one year when correct treatment is prescribed. The differential diagnosis of subepidermal blisters should include linear immunoglobulin A bullous disease of childhood, epidermolysis bullosa acquisita, bullous systemic lupus erythematosus and bullous pemphigoid. Appropriate treatment can only be based on correct and rapid diagnosis.

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