Coeliac disease and type 1 diabetes in a paediatric setting

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Article points

1. The long-term health risks of untreated coeliac disease are well documented.
2. There is an increased risk of coeliac disease in people with type 1 diabetes.
3. While the impact of a dual diagnosis on a child or young person should not be underestimated, the need for prompt and regular screening needs consideration by all paediatric diabetes teams.
4. The long-term health benefits of identifying and managing coeliac disease are clear.

Key words

- Coeliac disease
- Gluten
- Screening
- Immunoglobulin A endomysial antibody
- Transglutamase antibody
- Jejunal biopsy

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Since the publication of the National Institute for Health and Clinical Excellence guideline *Type 1 diabetes: diagnosis and management of type 1 diabetes in children and young people* (National Collaborating Centre for Women's and Children's Health, 2004), the need to screen for diabetes-associated conditions has been promoted as a requirement on the diagnosis of type 1 diabetes, and, subsequently, at regular points in the life of a child or young person. The authors present the experiences of a paediatric diabetes team based within a district general hospital setting in terms of the current methods of screening and diagnosis of coeliac disease within their area, the prevalence of coeliac disease and type 1 diabetes in the population attending clinics within the authors' area of work, and the impact that this may have upon the day-to-day management of diabetes. Consideration is also given to the ethical issues of screening on diagnosis.

The National Institute for Health and Clinical Excellence (NICE; National Collaborating Centre for Women's and Children's Health [NCCWCH], 2004) states that:

> *'Children and young people with type 1 diabetes have a higher prevalence of autoimmune disorders such as coeliac disease […] compared with children and young people without type 1 diabetes.'*

If unidentified or untreated, coeliac disease increases a person's risk of lymphoma and ulcerative jejunoileitis. Metabolic bone disease has also been identified as a complication of long-standing, poorly controlled coeliac disease. Some of the long-term complications of coeliac disease can be minimised by concordance with a gluten-free diet (Smith and Watson, 2005).

Smith and Watson (2005) identify that the clinical presentation of coeliac disease is extremely variable. Classic symptoms may include recurrent attacks of diarrhoea, steatorrhoea, abdominal distension, flatulence and stomach cramps. It should be recognised that in children symptoms may be subtle, unidentified or misinterpreted, and that diagnosis of coeliac disease in the general paediatric population may occur following investigations for failure to thrive. There is also a description of asymptomatic coeliac disease, and the diagnosis is made coincidentally.

Prevalence

With regard to the prevalence of coeliac disease within the general population, figures quoted vary between one in 300 and one in 100 (Coeliac UK, 2006d), making coeliac disease the leading cause of malabsorption in the UK (Coeliac UK, 2006d). Within the general paediatric population, the prevalence is quoted as being between one in 3000 and one in 500 (Barera et al, 1991).

Among people with diabetes, the prevalence of coeliac disease is seen to rise significantly, with between 1% and 8% of the paediatric diabetes population being quoted as also having coeliac disease (Cronin and Shanahan, 1997; Barera et al, 2002).

Within the authors' clinic population of children and young people with diabetes (up to the age of 18), there are eight individuals who have a dual diagnosis of type 1 diabetes and coeliac disease, out of a total of 150. This translates into a local prevalence of 5.3% of the current paediatric diabetes population. Of these, one child was diagnosed with coeliac disease 2 years before her diagnosis of diabetes. Three others were diagnosed with coeliac disease a period of time after the diagnosis of type 1 diabetes through routine screening at annual review; none of these individuals experienced overt or classic symptoms of coeliac disease prior to diagnosis of the condition.

The remaining four children and young people had a diagnosis made concurrent to that of diabetes; that is, the blood screening tests for coeliac disease were positive at the time of diagnosis of type 1 diabetes, and jejunal biopsy confirmed the diagnosis of coeliac disease. Of these, only one young male was able to identify any gastrointestinal symptoms prior to the diagnosis of coeliac disease and diabetes that would have potentially led to appropriate investigations being completed if the diagnosis of diabetes had not intervened. (*Table 1* provides two case presentations.)

It should also be noted that within the authors' caseload there are other children and young people who have experienced abnormal screening bloods, but whose jejunal biopsy has been normal; these children and young people continue with annual screening.

This local prevalence rate of 5.3% corresponds with the rates contained within published articles (mentioned above; Cronin and Shanahan, 1997; Barera et al, 2002), and highlights the importance of screening promptly upon diagnosis and regularly thereafter.

Screening and diagnosis

NICE (NCCWCH, 2004) promotes the screening for coeliac disease to be:

> *'performed close to diagnosis and as necessary thereafter.'*

Within the authors' area the decision has been made that coeliac disease screening will take place on initial diagnosis of diabetes, and then every 3 years subsequently, subject to any strong family history or previous anomalous results, and in these cases screening may occur annually.

There are several tests that are available to screen for coeliac disease. NICE (NCCWCH, 2004) advises the use of immunoglobulin A (IgA) endomysial antibody screening via immunofluorescence as being the most accurate screening test for coeliac disease, based upon a systematic review of test characteristics. Other tests that are in common use for coeliac disease screening purposes include the use of transglutamase antibody (often referred to as 'tissue transglutamase antibody') and antigliadin antibody.

It is not within the scope of this article to discuss interpretation of the results of these tests, but it should be noted that a definitive diagnosis of coeliac disease is made via a jejunal biopsy. Accordingly, while families should be fully informed of the results of any screening test, in the event that the tests are positive, they should be advised to not make any changes to diet prior to a jejunal biopsy occurring; removal of gluten from the diet will restore the gut to normal function (Chudleigh and Hunter, 2005; Smith and Watson, 2005), and thus result in a false-negative biopsy investigation.

Page points

1. Between 1% and 8% of the paediatric diabetes population are quoted as having coeliac disease.
2. Within the authors' paediatric clinic population, 5.3% of those with type 1 diabetes also have coeliac disease.
3. The National Institute for Health and Clinical Excellence advises the use of immunoglobulin A endomysial antibody screening as being the most accurate screening test for coeliac disease.
4. A definitive diagnosis of coeliac disease is made via a jejunal biopsy.

Table 1. Short case presentations.

Case study 1: 'BG'

- BG is an 8-year-old female who was diagnosed with coeliac disease aged 3 years after investigations for failure to thrive.
- BG was diagnosed with type 1 diabetes aged 5 years. It was a classical presentation, not diabetic ketoacidosis.
- BG's diabetes was initially managed with twice-daily, free-mixed soluble insulin (Human Actrapid; Novo Nordisk, Crawley) and isophane insulin (Human Insulatard; Novo Nordisk). BG was transferred to biphasic insulin aspart (NovoMix 30; Novo Nordisk) after 3 months.
- BG was subsequently moved to a three-times-daily regimen of biphasic insulin aspart with breakfast, a short-acting analogue (insulin aspart; NovoRapid; Novo Nordisk) with the evening meal, and isophane insulin at night, in response to post-prandial hypoglycaemia in the evening and associated fasting hyperglycaemia.
- BG becomes symptomatic (nausea, vomiting, abdominal pain and loose stools) if gluten is accidentally ingested in her diet, even in very small amounts.

Case study 2: 'SC'

- SC is a 14-year-old male who presented with severe diabetic ketoacidosis in September 2005.
- Immunoglobulin A endomysial antibody screening performed at diagnosis of diabetes was positive, as was the repeat.
- Jejunal biopsy confirmed coeliac disease.
- SC currently uses twice-daily biphasic insulin aspart (NovoMix 30; Novo Nordisk, Crawley).
- SC was apparently asymptomatic for coeliac on diagnosis of diabetes; however, he feels that on reflection several mild symptoms were present (bloating, flatulence and abdominal pain) that have resolved with the commencement of a gluten-free diet.
- SC is a rugby player; he feels that he is playing at a better level following the diagnosis of diabetes and coeliac disease than he has been for some time.

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1. Jejunal biopsy may be required in cases of immunoglobulin A deficiency to confirm or exclude a diagnosis of coeliac disease.
2. The management of coeliac disease is achieved through the removal of all sources of gluten within the diet.
3. Prompt referral to a dietitian is required once coeliac disease has been diagnosed, and subsequent education and dietary review often takes place alongside diabetes dietary review within paediatric diabetes clinics.

What should be considered within the paediatric diabetes population is that both IgA endomysial antibody screening and transglutamase antibody screening rely upon the presence of IgA. IgA deficiency increases a person's risk of coeliac disease (Schwarzenberg and Brunzell, 2002; Lenhardt et al, 2004); therefore, negative results cannot be relied upon to exclude coeliac disease. Coeliac UK (2006b) advises that jejunal biopsy may be required in cases of IgA deficiency to confirm or exclude a diagnosis of coeliac disease. This may need to be considered within the paediatric diabetes population if there are significant concerns about individuals' risk of coeliac disease in cases where they have been diagnosed as being IgA deficient.

Clinical management

The management of coeliac disease is achieved through the removal of all sources of gluten within the diet.

Prompt referral to a dietitian is required once coeliac disease has been diagnosed, and subsequent education and dietary review often takes place alongside diabetes dietary review within paediatric diabetes clinics. It should be recognised that gluten is often present as a thickening agent in some foods, and that gluten-containing cereals may be used to add bulk to some food items such as sausages. Families need to prevent gluten cross-contamination occurring, and they will be instructed by dietetic staff to prepare gluten-containing foods away from gluten-free foods and informed that strict hand

washing needs to be maintained (Chudleigh and Hunter, 2005).

Glycaemic control

With respect to diabetes management and glycaemic control, the effects of removing gluten from the diet will need observing closely. Issues to consider are as follows.

- The malabsorption that has been occurring because of villous atrophy will be corrected as the mucosa recovers (Chudleigh and Hunter, 2005; Smith and Watson, 2005). This may mean that blood glucose levels alter once a gluten-free diet commences.
- Gluten-free foods, especially biscuits, tend to contain higher levels of refined sugar than their gluten-containing alternatives (Coeliac Disease Resource Centre, 2004); this is to make the product more palatable in the absence of gluten.
- Fibre content is generally lower in gluten-free foods (Coeliac UK, 2006a), so there may need to be encouragement of alternative sources of fibre in the diet, such as fruits and vegetables.

Schwarzenberg and Brunzell (2002) comment that people with type 1 diabetes and coeliac disease may find maintenance of blood glucose control easier after diagnosis and treatment of coeliac disease.

Gluten-free foods

Coeliac UK

Coeliac UK offers much the same support to people with coeliac disease as Diabetes UK offers to people with diabetes. It is a source of up-to-date information and guidance on gluten-free foods (Coeliac UK, 2006c).

Prescribing

Dietitians will be able to prescribe suitable gluten-free products that are considered essentials, such as bread, pasta and biscuits. It should be noted that some gluten-free foods are not considered essential and therefore are not available on prescription. Those items that are available on prescription are classified as 'borderline substances' by the *BNF for Children* (British Medical Association et al, 2005); that is, they are a foodstuff with the characteristics of drugs (being prescribed for use with specified conditions). Accordingly, the *BNF for Children* states that doctors should satisfy themselves that:

> *'patients are adequately monitored and […] hospital supervision is available."*

Dietary supplements

Anaemia can be a common complication of coeliac disease and may need to be managed with the use of iron supplements, vitamin B_{12} and folic acid (Smith and Watson, 2005). Similarly there is a need to consider vitamin and mineral supplements (including calcium) in some cases, especially those with severe presentations (Schwarzenberg and Brunzell, 2002; Chudleigh and Hunter, 2005).

Insulin

With regard to insulin, each child and young person will need an individually tailored regimen to suit his or her own lifestyle, taking into consideration the dietary issues discussed previously.

Ethical considerations

At the time of diagnosis of type 1 diabetes, a child or young person and his or her family have the impact of the diagnosis of a chronic

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2. Coeliac UK is a source of up-to-date information and guidance on gluten-free foods.
3. Dietitians will be able to prescribe suitable gluten-free products that are considered essentials; these are classified as 'borderline substances' by the *BNF for Children.*

A selection of gluten-free foods.

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1. At the time of diagnosis of type 1 diabetes, a child or young person and his or her family have the impact of the diagnosis of a chronic condition to cope with.
2. When any form of health promotion takes place there is a need to ensure that the decision for screening is underpinned by some key ethical principles: respect for autonomy, beneficence, non-malfeasance and justice.
3. In the same way that glycaemic control is essential to prevent long-term microvascular and macrovascular complications, suitable screening for associated autoimmune conditions has to be performed.

condition to cope with. Within the initial few days they will receive a large amount of advice and education. 'Information overload' can be a problem for families at this time, and so it is important to ensure that if blood screening tests are performed at diagnosis for autoimmune conditions associated with type 1 diabetes (such as coeliac disease and hypothyroidism), then children, young people and their families are fully informed as to the nature and reason behind the investigations, the possible outcomes, and any treatment that would be required in the event of a further diagnosis being made.

When any form of health promotion takes place (including health screening) there is a need to ensure that the decision for screening is underpinned by some key ethical principles: respect for autonomy, beneficence (doing good), non-malfeasance (doing no harm) and justice (Katz et al, 2001). While the outcomes of screening for coeliac disease within a child or young person newly diagnosed with type 1 diabetes may appear to be doing good (the identification of a potential second chronic condition allowing diagnosis and correct management), if the screening is performed without an adequate level of information and support from the family in the form of informed consent, then the need to be non-malfeasant has been overlooked. The potential psychosocial impact of a dual diagnosis should not be underestimated.

Conclusion

The long-term health risks of untreated coeliac disease are well documented. As the published figures show, the increased risk is significant within people with type 1 diabetes. While the impact of a dual diagnosis on a child or young person should not be underestimated, the need for prompt and regular screening as stated within NICE guidance (NCCWCH, 2004) needs consideration by all paediatric diabetes teams. The long-term health benefits of identifying and managing coeliac disease are clear. In the same way that glycaemic control is essential to prevent long-term microvascular and macrovascular complications, suitable screening for associated autoimmune conditions has to be performed. ■

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