EASILY MISSED?

Klinefelter's syndrome

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EDITORIAL by Pitteloud
PRACTICE, pp 34, 36

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This is one of a series of occasional articles highlighting conditions that may be more common than many doctors realise or may be missed at first presentation. The series advisers are Anthony Harnden, university lecturer in general practice, Department of Primary Health Care, University of Oxford, and Richard Lehman, general practitioner, Banbury. To suggest a topic for this series, please email us at easilymissed@bmj.com.

KEY POINTS

Klinefelter's syndrome (47,XXY) has wide phenotypic variability. Small testes and infertility are present in almost all patients. More variable clinical findings include decreased facial and pubic hair; tall, slender body habitus; history of gynecomastia; decreased libido; and learning disabilities or psychosocial or behavioral concerns

If Klinefelter's syndrome is suspected, check serum luteinising hormone, follicular stimulating hormone, and testosterone concentrations; if gonadotropin concentrations are abnormal, consider specialty referral and chromosome analysis

Klinefelter's syndrome is associated with increased risk of osteoporosis, diabetes mellitus, venous thromboembolism, and breast cancer

A 29 year old man presented to primary care with anxiety and depression that had worsened since childhood. Further questioning revealed a history of poor school performance, poor body image, and poor self esteem. On physical examination, the patient's height was 189 cm and he had narrow shoulders, wide hips, sparse facial hair (which he shaved once every two months), and small, firm testicles. He was found to have elevated luteinising hormone and follicular stimulating hormone concentrations, low serum concentrations of testosterone, absent sperm on semen analysis, and a karyotype of 47,XXY.

What is Klinefelter's syndrome?

Klinefelter's syndrome is the clinical result of an additional X chromosome in males (47,XXY), although other chromosome abnormalities (such as 46,XY/47,XXY mosaicism; 48,XXXY; 49,XXXXY) account for 10-20% of cases.[1 2] Classic clinical findings include infertility, small testes, hypergonadotropic hypogonadism (elevated luteinising hormone and follicular stimulating hormone concentrations with low or low to normal testosterone concentrations), decreased facial and body hair, gynecomastia, tall stature with eunuchoid features, and psychosocial morbidity.[1 3]

Why is Klinefelter's syndrome missed?

Although virtually all men with Klinefelter's syndrome have infertility and small testes, there is wide variability in the frequency of other phenotypic features (table 1). Additionally, the classic phenotypic features may not all be present simultaneously.[5] Many individuals with Klinefelter's syndrome may have subtle clinical findings, especially prepubertal boys and men affected with mosaic forms.[2 8] Individuals with subtle clinical findings may not present for medical evaluation until later in life when hypogonadism, sexual dysfunction, or infertility become apparent.[3] Furthermore, a lack of awareness among physicians about Klinefelter's syndrome contributes to a delay in diagnosis in nearly 60% of cases.[2]

Why does this matter?

Klinefelter's syndrome has been associated with several complications, many of which are secondary to chronic untreated hypogonadism (table 2). Early recognition of hypogonadism can lead to appropriate management and prevention of associated outcomes.[2 8] Complications such as diabetes, cardiovascular disease, pulmonary embolism, and peripheral vascular disease have been associated with increased mortality rates in patients with Klinefelter's syndrome.[16] In addition, early recognition of psychosocial morbidity can facilitate speech therapy and educational support, which improve scholastic performance.[5 17] Cryopreservation of any sperm identified at the early onset of puberty (before most of the germ cell destruction has occurred) may enhance future attempts to increase fertility by using techniques such as intracytoplasmic sperm injection.[18]

HOW COMMON IS KLINEFELTER'S SYNDROME?

- Klinefelter's syndrome affects 1 in 667 live male births and is the most common sex chromosome disorder[4]
- Large population based studies confirm that more than 90% of boys with Klinefelter's syndrome aged 10-14 years and about 75% of men with the syndrome aged 25-54 years remain undiagnosed[4]

How is Klinefelter's syndrome diagnosed?

Clinical features

The classic clinical description includes infertility; small firm testes; decreased facial and pubic hair; tall, slender body habitus (with long legs, narrow shoulders, and wide hips); gynecomastia or history of gynecomastia during puberty; decreased libido; history of cryptoorchidism; learning disability; delayed speech development; behavioural problems; and psychosocial disturbances. Although infertility and small testes are present in about 99% of individuals, other clinical features are present with varying frequencies (table 1), and many individuals may have only subtle clinical features. The presence of any one of the listed features may warrant further investigation for Klinefelter's syndrome.

Investigations

If the clinical assessment suggests Klinefelter's syndrome, luteinising hormone, follicular stimulating hormone, and testosterone concentrations should be obtained. In post-pubescent males, this will typically show hyper-

Table 1 | Estimated frequencies of clinical features of Klinefelter's syndrome

Clinical finding	Frequency (%)
Infertility	99-100[6 7]
Small testes (<4 mL)	98[6]
Increased gonadotropin concentrations*	90-100[8]
Decreased testosterone concentrations	79[6]
Decreased facial hair	77[6]
Decreased pubic hair	61[6]
Abdominal adiposity	50[9]
Cryptoorchidism	27-37[10]
Gynecomastia	50-75[10 11]

*Luteinising hormone and follicular stimulating hormone.

Table 2 | Estimated frequencies of clinical conditions associated with Klinefelter's syndrome

Clinical finding	Frequency
Metabolic syndrome (%)	33-46[5 9]
Type II diabetes mellitus (%)	20[12]
Varicose veins (%)	20[8]
Sexual dysfunction (%)	9-60[5]
Osteoporosis (%)	6-15[13]
Venous ulcers (%)	6[14]
Breast cancer (%)	3[15]
Deep vein thrombosis (incidence)*	22.8[14]
Pulmonary embolism (incidence)*	16

*Per 10 000 patient years.

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- Perilunate dislocation (*BMJ* 2012;345:e7026)
- Hirschsprung's disease (*BMJ* 2012;345:e5521)
- Pre-eclampsia (*BMJ* 2012;345:e4437)
- Post-traumatic stress disorder (*BMJ* 2012; 344:e3790)
- Herpes simplex encephalitis (*BMJ* 2012;344:e3166)

gonadotropic hypogonadism (always elevated luteinising hormone and follicular stimulating hormone concentrations with usually low or low to normal testosterone concentrations).[3 8] Testosterone, luteinising hormone, and follicular stimulating hormone concentrations are usually normal in prepubescent males. If the patient has abnormal gonadotropin concentrations, then specialty referral for confirmatory testing with chromosome analysis is warranted. For patients with infertility or hypogonadism arrange a semen analysis. Once Klinefelter's syndrome has been confirmed, consider screening for diabetes, dyslipidemia, and osteoporosis.[1]

How is Klinefelter's syndrome managed?

Consider testosterone replacement, starting at puberty, if there is clinical evidence of androgen deprivation.[5] In patients with Klinefelter's syndrome, testosterone replacement therapy improves mood, muscle strength, libido, self esteem, and behavioral difficulties; increases body hair; reduces fatigue; and has been associated with improved cardiovascular outcomes and increased bone mineral density.[2] Additional treatment modalities include a multidisciplinary neurodevelopmental and psychosocial assessment. Speech and behavioral therapy, providing individualised school assistance, and treating any associated psychiatric conditions are warranted.[19] Infertility does not improve with testosterone replacement, although advanced techniques such as microsurgical testicular sperm extraction and intracytoplasmic sperm injection have achieved limited success.[1] Finally, providing patients with access to support groups may be beneficial—for example, in the United Kingdom, the Klinefelter's Syndrome Association (www.ksa-uk.co.uk), and in the United States the KS&A (www.genetic.org).

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A PATIENT'S JOURNEY

Klinefelter's syndrome—a diagnosis mislaid for 46 years

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The patient was initially diagnosed in 1959 at the age of 14 years, but never informed of the diagnosis. He experienced physical and psychological ill effects until re-diagnosis 46 years later

"Is my life a lie? Am I a man or a woman?" This was my reply in May 2006 when I was asked, "How do you feel at this moment?" I had just had my diagnosis of Klinefelter's syndrome confirmed. It had first been diagnosed 46 years previously, but I had not been told. This had led to emotional turmoil and endless questions, most of which I could not answer. I was angry, sad, bitter, guilty, and confused in no particular order.

I do remember being taken to the Birmingham Children's Hospital in my early teenage years, although the details of the visit are hazy. I do not remember a diagnosis being mentioned. My abiding memory of the period was one of lacking energy and severe muscle weakness, which led to an avoidance of sport. Unlike my peers, I did not shave and was a loner. A lack of concentration and confidence was constantly noted.

On leaving school, I trained as a chef, but an inability to cope with the pressure of the profession resulted in my quitting. I then became a clerical worker and, on being

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- Thoracic outlet syndrome (*BMJ* 2012;345:e7373)
- Visual agnosia (*BMJ* 2012;345:e7342)
- Psychotic depression (*BMJ* 2012;345:e6994)

CLINICIANS' PERSPECTIVES

Klinefelter's syndrome was first described by Harry Klinefelter in 1942 and occurs in males with an incidence of 1 in 600. An affected male has at least one additional X chromosome. Presentation symptoms vary depending on age. In children, the symptoms often involve learning difficulties such as delay and difficulties in speech, reading, and writing. Presentation in adolescence is more likely to be with abnormal breast development, while infertility is often the complaint in adulthood (Klinefelter's syndrome accounts for about 4% of all male infertility). Other features may include a characteristic appearance (tall, slender body with long legs and short torso), gynaecomastia, hypogonadotrophic hypogonadism, diminished pubic hair, osteoporosis, small firm testes, and psychosocial or behavioural issues. Diagnosis is often dependent on the clinician possessing an insight of Klinefelter's syndrome.

This patient was referred to the Birmingham Children's Hospital in 1959 with unrelated syncope attacks. The registrar in endocrinology investigated for Klinefelter's syndrome based on his clinical suspicion. A buccal mucosal smear revealed a female nuclear chromatin pattern, and a testicular biopsy showed an absence of Sertoli cells in the seminiferous tubules. Bone marrow examination revealed two cells containing 47 chromosomes. These results confirmed his initial suspicion.

On re-referral to endocrinologists 46 years later, the patient demonstrated a XXY chromosomal pattern. His testosterone level was low, 1.9 nmol/L. Testosterone gel was started and unfortunately led to polycythaemia when the dose was increased to 100 mg daily. Regular monitoring of packed cell volume and testosterone levels took place, with venesection performed when the packed cell volume exceeded 0.54. Although the packed cell volume settled, the PSA concentration increased from 4.44 ng/mL in December 2009 to 11.4 ng/mL in August 2011, and on repeat testing in September 2011 was 12.3 ng/mL. Testosterone gel was reduced to one sachet (50 mg) daily, with the PSA level reassuringly reducing to 4.49 ng/mL, but the testosterone level not surprisingly decreased to 4.2 nmol/L. After a urology opinion, the testosterone dose was increased to 1.5 sachets.

The patient had genetic counselling upon its availability in 2010 and benefited considerably.

This is a tale of ineffective communication sadly affecting the life of a patient. A mislaid diagnosis in this case negated all the impressive work that took place in making the initial diagnosis. The end effect was the same as a diagnosis missed for 46 years. Communications between primary and secondary care when copied to the patient could prevent similar sad scenarios, and the use of electronic patient records could prevent communications from being mislaid.

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made redundant, gained employment in a local brewery. I met my future wife, a coworker in the brewery, and we married in 1968. We yearned for a child, unaware of my associated infertility. At the age of 40 years, I was diagnosed with Crohn's disease and underwent bowel surgery, leaving me with an ileostomy. This resulted in early retirement. Thus, I slipped into a quiet and mundane life that did not require energy.

This unexciting but comfortable existence was shattered in 2005 when, after a flare up of symptoms related to Crohn's disease, my GP reviewed my case notes before referral. I was shown a letter, written in 1959 by the specialist at the Birmingham Children's Hospital. This folded letter had been in my file, seemingly unread. The doctor read it out to me and said that I had been diagnosed with Klinefelter's syndrome and my father had been informed. I did not know what Klinefelter's syndrome meant and requested a copy of the letter and an appointment with an appropriate specialist. I was seen in the endocrinology clinic at Good Hope Hospital.

On my next visit, Klinefelter's syndrome was confirmed. This condition was explained to me at that point. Initially I could not take in most of what I was told. Chromosomes, sex chromosomes, X's and Y's were mentioned; my mind was confused. Was I living a lie? I did bring this up and was told that I was a man with an extra X chromosome. This was a relief as I had not being living a lie. My wife was as supportive as ever. I approached my father, and he said that he had been informed of a diagnosis but had not understood it and put it out of his mind.

The next question bothering me was how had this condition affected my life? It seemed that my low energy levels, physical weakness, and lack of facial hair were due to the reduced testosterone. What about children? It was explained that infertility was also related to the condition. We could have adopted a child if I had known. That would have given my wife and me something we longed for—a child.

I also had a bone scan, this was normal. At last, something right in my life. I was told that I needed testosterone. I perceived that the lack of this was what had ruined my life. Why did I have to wait until I was over 60 years old to have testosterone? I was asked to rub on testosterone gel, and this was followed up with blood tests. Within days I felt better, much better, and facial hair appeared. I did not shave; the facial hair now comforted me.

Trouble once again. I was told that my red blood cell count had increased. I was sent to a haematologist, who, after more blood tests, suggested taking a pint of blood every two months depending on my blood count. I could continue to take my testosterone, and this was now increased to two sachets of gel daily. After some time, the red cell count stopped rising above the level considered dangerous.

Matters did not remain calm for long. I was told that my PSA (prostate specific antigen) level, a possible marker of prostate cancer, was raised, perhaps due to the testosterone treatment. I was sent to a urologist. More blood tests, and then the testosterone dose was dropped to one sachet daily. Biopsy was discussed, but there was a risk in view of my ileostomy. Although my PSA level came down, I did not feel well on the lower dose of testosterone—much weaker and with no life within me. I have increased the dose to a sachet and a half and will be followed-up closely.

Have I entered calmer waters? Only time will tell. After these turbulent five years, I am certain that my life is not a lie—I am a man.

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A PATIENT'S JOURNEY

Kallmann syndrome

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This is one of a series of occasional articles by patients about their experiences that offer lessons to doctors. The *BMJ* welcomes contributions to the series. Please contact Peter Lapsley (plapsley@bmj.com) for guidance

Diagnosed with Kallmann syndrome at 22 years old, this patient describes the consequences of late diagnosis

My early childhood was fairly uneventful medically apart from 70% hearing loss in one ear and no sense of smell. I reached what I now know to be the normal pre-puberty Tanner stages, and up to the age of 12 years nothing seemed to be amiss. Through my early teenage years I awoke each day hoping something would start to develop. I knew it was getting late to start puberty, but I assumed it would all start soon enough. Eventually I was the only one in my year group not to show any development, and this was certainly noticed by the rest of the year group.

A routine health inspection by the school nurse as part of the health screen for a permit to work on a newspaper delivery round led to a referral to a general practitioner at the age of 15 years. At that stage the GP said I was just late starting, that I should wait and see, and I was sent on my way.

Teenage years

Up to the age of 14, I was a normal enough schoolboy I think. I was in the Scouts and involved in my local cricket club. I gradually got left out of social events as I lacked confidence to go and had no sexual drive at all. I knew the basics from a physical point of view but had no libido or interest in teenage activities. I made up excuses not to go to social events, and eventually I stopped being invited.

By the age of 17, it was clear that nothing was starting so I was referred by my GP to my local general hospital, first to a general medicine consultant and then to a urologist. I was put on low dose injectable testosterone (Sustanon) monthly but not offered any follow-up assessment; it was just assumed everything would all start naturally.

By the time I went to university, something was obviously wrong, but I did not have the drive to do anything about it. I even stopped taking the Sustanon for a time as it seemed to be having no effect on me apart from a slight growth spurt. Looking back now, there were opportunities for me at university, but, without the drive and the knowledge of the condition, I did not have the interest or confidence to notice them, let alone follow them up.

USEFUL RESOURCES FOR PATIENTS AND HEALTH PROFESSIONALS

- UK Pituitary Foundation (www.pituitary.org.uk)
- Endocrinology Society (www.endocrinology.org)
- Kallmanns.org website for the Kallmann Syndrome Organisation (www.kallmanns.org)
- Kallmann syndrome blog site (www.kallmannsyndrome.wordpress.com)
- Yahoo based patient forum (http://health.groups.yahoo.com/group/kallmanns-syndrome)
- Facebook based patient groups: Kallmann Syndrome Links & Help or Kallmann's syndromers. There is also a hidden "secret" group that remains hidden from other friends on your Facebook list
- Wikipedia page for Kallmann syndrome (http://en.wikipedia.org/wiki/Kallmann_syndrome)—A good source of information on the syndrome

Diagnosis

I first saw an endocrinologist when I started my first job, as a biomedical scientist at the Royal Free Hospital in London. I had studied endocrinology and haematology as part of my biomedical science degree and had some understanding of how puberty was supposed to work. Choosing the endocrinology pathway for my degree was partly driven by the wish to know more about my own situation. When I started work at the Royal Free I was determined to talk to an endocrinologist even though my GP still had not referred me. Under my own volition, I contacted Richard Quinton, then a senior endocrinology registrar under Pierre-Marc Bouloux. One of the first questions he asked was, "Do you have a sense of smell?" It was the first time any doctor had asked me that question. It was also the first time any doctor had mentioned Kallmann syndrome to me.

The correct diagnosis soon followed, and I was prescribed a suitable dose of testosterone, first in the form of Testogel and then later Nebido. The delay in suitable treatment from the age of 16 to 22 meant I went six years with a very low testosterone level, with the subsequent delay in secondary sexual development and bone strength.

Blood tests confirmed the low levels of follicle stimulating hormone (FSH) and luteinising hormone (LH) that, combined with the anosmia, confirmed the diagnosis. Magnetic resonance imaging showed the absence of the olfactory bulbs, and a bone density (DEXA) scan showed osteopenia. At the time of diagnosis, I probably looked 10 years younger than I was and had never shaved.

Delay of diagnosis

Physically, late diagnosis has left me with osteopenia, which is still present but at least not deteriorating. I have recently been found to have severe vitamin D deficiency, which probably contributes to the osteopenia, for which I take a 1000 IU vitamin D supplement. The lack of gonadotrophins and hence androgens in my teenage years also delayed the development of secondary sexual characteristics. The lack of testicular development will always be present. The relative lack of penile growth remains a constant frustration. There will always be the question of what would have happened if testosterone treatment had been started earlier and at the physiologically correct dose.

I did achieve some testicular development and limited sperm development while on a gonadotrophin clinical trial. This lasted only for as long as the trial lasted, but it gives me hope for future fertility, and the increase in testicular size did bring some reassurance and better self confidence.

It is on the psychological level that my delayed diagnosis has had the biggest impact. From my own experiences and those of fellow patients, this is often overlooked.

With puberty and adolescence so closely linked, a patient who does not enter puberty at almost the same stage as his peers risks being left behind socially and emotionally, as well as physically. I feel this emotional

A CLINICIAN'S PERSPECTIVE

Congenital hypogonadotrophic hypogonadism (CHH), also known as isolated gonadotrophin deficiency, occurs in around 1 in 4000 men, over 60% of whom exhibit a non-reproductive defect, most commonly anosmia (lack of sense of smell). It is defined by serum testosterone <6 nmol/L, with low or "inappropriately normal" serum gonadotrophins (LH and FSH). It is three to five times less common in women. The combination of CHH with anosmia defines Kallmann syndrome. Anosmia is 100% ascertainable without formal testing by simply asking the patient: "Do you have a sense of smell? Can you smell coffee being brewed or food being cooked?" Unlike "medicolegal malingerers," anosmic patients will identify volatile irritants such as vinegar and bleach through their trigeminal chemosensory system.

The 1000-2000 gonadotrophin releasing hormone (GnRH) neurones that regulate human reproduction arise, remarkably, in the embryonic nasal placode and then migrate to the hypothalamus (where they eventually form a synchronised network). A genetic insult during intrauterine development leads to neural disconnection between the nose and brain, with GnRH neurones left stranded beneath the cribriform plate. Hence, congenital anosmia and GnRH deficiency.

Mutations in 19 different genes have thus far been found in CHH, of which 11 are specifically linked with Kallmann syndrome, yet the genetic basis of over half of CHH cases remains to be elucidated. Broadly speaking, products of the "Kallmann syndrome genes" have a role in olfactory nerve development, whereas those of "pure CHH genes" regulate GnRH neurosecretory function. Patients harbouring heterozygous (mono-allelic) mutations of two or more different CHH genes are increasingly being identified (oligogenic inheritance).

The physiological consequences of absent GnRH action are profound. Around 30% of affected males are born with one or both testes undescended, and 5-10% have micropenis or hypoplastic scrotum, or both. Indeed, it is possible to diagnose CHH up to six months after birth by demonstrating lack of "mini-puberty" (normal male neonates exhibit levels of testosterone, LH, and FSH that are not far off the adult male reference range). Nevertheless, these boys typically only get surgical review in the UK without paediatric endocrine input, and therefore the opportunity to make an early diagnosis is lost.

Otherwise, the typical presentation in males is with delayed or absent puberty, which may not always be immediately distinguishable from "constitutional" delay. However, if the boy is anosmic or has a history of undescended testes, neonatal micropenis, cleft lip/palate, or deafness, then the pre-test probability of CHH increases exponentially. Reassurance or "wait and see" approaches, however well meant, can have devastating long term psychological consequences, and the overwhelming preference expressed by males with pubertal delay is to receive androgen replacement therapy, so as to enable them to undergo puberty alongside their peer group. Those whose endogenous puberty is "triggered" by androgen replacement (evidenced by increasing size of testes) can simply be reassessed later off therapy.

However, many UK doctors seem culturally reluctant to initiate a conversation about hypogonadism, waiting instead for patients to bring up the problem. If we physicians find it such a tricky subject to bring up, we can barely imagine just how hard it must be for patients to pluck up the courage and speak up. The Newcastle upon Tyne Endocrine Unit finds itself having to induce puberty in previously untreated CHH males aged over 40 years almost on an annual basis.

Timely sex hormone replacement therapy will result in a normal appearing and normally functioning man (or woman) indistinguishable from normal phenotype, but delayed initiation or inadequate dose greatly increases the risk of osteoporosis and psychosocial maladjustment. However, induction of fertility requires exposure to gonadotrophins so as to stimulate endogenous gonadal function. Reassuringly, there have only been a handful of reported cases of CHH having been inherited after successful fertility treatment.

Fertility treatment can be elegantly achieved through pulsatile subcutaneous infusion of GnRH via minipump (which physiologically reverses the underlying neurosecretory deficit), but this is not widely available outside a handful of specialist centres worldwide. Most commonly, fertility is achieved through subcutaneous gonadotrophin injections (FSH and human chorionic gonadotropin). Women with CHH can be often induced to ovulate after just a week of treatment, though commercial providers may offer (much more expensive) in vitro fertilisation, instead. However, CHH men may require up to two years of continuous gonadotrophin treatment to achieve adequate spermatogenesis. Nevertheless, the treatment is quite successful, with around a 40% chance of spontaneous impregnation of their partner, plus another 20-30% chance if the couple proceeds to in vitro fertilisation (less if there is a history of cryptorchidism).

The obstacles to CHH males accessing treatment are threefold. Firstly, they and their doctors may not even be aware that normal fertility can be achieved, instead assuming that they are irrevocably infertile. Secondly, there is no specific funding stream for gonadotrophin treatment of male infertility in the NHS, so that even informed, motivated patients can face years of dispiriting "buck passing" between primary and secondary healthcare providers. Finally, only a few endocrinologists and reproductive gynaecologists have experience of spermatogenesis induction with gonadotrophins.

Richard Quinton

development of social interaction is difficult to catch up on and often results from feeling socially isolated when puberty fails to start.

I have not married, have never had any serious girlfriends, and have very limited sexual experience. I think this is a direct result of my lack of emotional and physical development while a teenager and young adult. Although many fellow patients I talk to do get married and have relationships, my experiences are by no means unique. I think early diagnosis is key to being able to build the confidence to develop relationships. The later you start the harder it is to catch up. From meeting fellow patients, those who are diagnosed and treated early cope with the condition better. For many, the very fact they can put a name to the condition and realise that they are not the only person in the world not going through puberty is a big step in being able to cope with the condition.

Treatments available

Once I was diagnosed the variation in possible testosterone treatments and fertility treatments became apparent. Up to then, I was not taking the appropriate dose of testosterone, which affected my energy levels and sex drive. Different forms of testosterone replacement methods exist, suiting different people at different times. I have tried a few, including gonadotrophin injections, which I found particularly beneficial as they induce a certain level of fertility and allow for limited testicular growth.

The most important treatment is possibly the diagnosis itself. Being labelled a "late starter" or "late bloomer" in your early 20s can be very humiliating. The ability to put a label to your condition and the knowledge that it is a recognised condition are the first steps in coming to terms with a condition that is difficult to describe to others. The use of patient support groups on Yahoo and Facebook also play a big part in being able to talk about the condition, but this is possible only once the correct diagnosis has been made.

The patient is happy to be contacted by any patient with Kallmann syndrome wishing to talk to another patient (email: neilsmith38@hotmail.com).

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