Pre-Natal Tests

and Turner Syndrome

The Bungle Pack

kindly supported by **Tracey and Lainey Walters**

in memory of

Corporal James Walters

affectionately known as **'Bungle'**

TSSS

Turner Syndrome Support Society

The Turner Syndrome Support Society (TSSS) is proud and very grateful to have produced 'The Bungle Pack', in memory of James Walters, affectionately known as 'Bungle'.

"James was extremely passionate about TS and made sure that we were as prepared as we could be for all aspects of Lainey's condition. He would be immensely proud and completely overwhelmed at how far his baby girl has come, and to know that the money raised in his memory is making a difference, by educating parents, saving TS girls' lives and supporting individuals with TS, their families and healthcare professionals."

Tracey Walters

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This booklet is written for healthcare professionals involved in the care of the pregnant mother whose baby may have Turner syndrome (TS).

The aim of the booklet is not to provide comprehensive medical guidance, but to include some helpful background information that will support discussions between healthcare professionals, the woman and her partner.

Overview of Turner Syndrome

Turner syndrome (TS) is a relatively common chromosome abnormality affecting only females. In classical TS the girl has only one X chromosome in her cells (45X karyotype). Alternatively, the girl has some cells in her body with two X chromosomes, but other cells have only one, and this is called mosaicism.

There is wide variability in the severity of clinical features between individuals (Donaldson et al 2006). Although textbooks often refer to the marked phenotype (physical characteristic) that is evident at birth, many girls with TS are diagnosed after the age of puberty, or even as adults, which reflects the increasingly recognised mild phenotype.

Although TS is a lifelong condition, most individuals live long and healthy lives, but some may have several associated long-term conditions which require routine medical screening, regular monitoring, and follow-up.

Cause of TS

The exact cause of TS is unknown. TS appears to occur as a random event during cell division, early in the development of the fetus. It is not usually inherited and the age of the mother does not increase the risk of TS. There are no clearly established risk factors and the recurrence of TS in subsequent pregnancies is rare.

Incidence and prevalence

TS occurs in approximately 1 in every 2000 to 1 in every 2500 live female births (Nielsen et al 1991). The true prevalence of TS is difficult to ascertain for many reasons; for example some individuals have a mild phenotype and may remain undiagnosed. TS occurs with more or less the same prevalence in all ethnic groups and in different countries.

Physical features and medical problems

Girls with TS may have distinctive features and associated health problems, some of which may be apparent at birth. However, individuals with TS are all different; some may have many physical differences, and other girls experience only a few medical problems.

Babies with TS may be born with lymphoedema affecting the hands and feet. Other physical features are listed below, but not all girls will have the problems on the list:

Physical features

- Short stature
- Webbed or broad neck
- Swelling of the hands and feet
- High arched palate with crowded teeth
- Low posterior hairline
- Deep forehead
- Atypical bone development affecting e.g. hands and elbows
- Red-green colour blindness
- Broad chest with widely spaced nipples
- Low set ears
- Abnormal finger and toe nails
- Short 4th metatarsal or metacarpal
- Wide carrying angle of the arms making it difficult to straighten the elbow
- Larger number of naevi compared to other members of the family
- Ptosis, strabismus, amblyopia, and cataracts are more common

TS may present the girl/woman, her family and the healthcare team with a wide range of genetic, developmental, endocrine, cardiovascular, psychosocial, and reproductive issues.

Management of TS

Children with TS should be referred to a hospital that has expertise in TS, and a interdisciplinary approach to the management of the condition. The paediatric endocrinologist will manage an overall care plan with regular assessments to monitor growth, puberty development, and referrals to the relevant medical speciality for treatment as necessary. Treatment will focus on the problems that occur; some features of TS will not require any intervention and others may be improved or treated with surgery, medicine, or other relevant therapies.

More than 95% of adult women with TS have short stature (Saenger et al 2001) and over 90% have signs of ovarian failure (Bondy 2007). Clinics for adults with TS are established in the UK where they monitor the associated long-term conditions including cardiovascular disease, hypertension, obesity, type 2 diabetes, hypothyroidism, sensorineural hearing loss, and osteoporosis.

Pre-natal screening tests

Ultrasound scan

A routine ultrasound scan of the fetus takes place at 8-12 weeks, and again at 20-22 weeks. The scan may identify some of the characteristics associated with TS, such as nuchal translucency, where there is a higher than average amount of fluid under the skin at the back of the baby's neck, cystic hygroma, lymphoedema, horseshoe-shaped kidney or left-sided heart abnormalities.

Cell-free fetal DNA test

The cell-free fetal DNA test is a fairly new non-invasive test. It analyses fetal DNA in the mother's blood and may identify a risk of TS.

Further tests are required to accurately diagnose TS.

Pre-natal diagnosis

Confirmation of the chromosome abnormality can be detected pre-natally by chorionic villus sampling (CVS) or amniocentesis (AC) (Saenger et al 2001). This will determine the fetal karyotype of the 23 pairs of chromosomes and confirm the presence of the 45X cell line.

Invasive genetic testing does carry a small risk of miscarriage. However, chromosome abnormalities are a common cause of early miscarriage and, as with all pregnancies, miscarriage can occur at any time.

- **Chorionic villus sampling:** This involves removal of a small piece of tissue from the placenta
- **Amniocentesis:** A sample of the amniotic fluid is taken from the uterus

Counselling and support

Before the diagnosis has been confirmed, the healthcare professional and the parents will have had a preliminary discussion about TS. The healthcare professional will have described what is involved in the diagnostic test, and should assume that the parents will have researched TS on the internet, whilst waiting for the results.

Genetic counselling is an integral part of the CVS or AC test process, but is generally not available until a diagnosis has been confirmed. The counselling is non-directive and aims to explain the facts as clearly as possible, giving the parents accurate information about TS in a way that they can understand, and help them to make informed choices. The medical facts and possible consequences should be discussed by the healthcare professional ordering the test.

For parents, the news that their child will be born with TS, may be extremely upsetting. They have to absorb the medical information they have been given whilst in a state of emotional shock and distress, and they have to work out a way forward that they can best live with.

Healthcare professionals and genetic counsellors involved in pre and post-diagnostic counselling need to fully inform the parents about the prognosis, complications, and quality of life of individuals affected with TS, as well as the recent advances in management. The uncertainty that faces parents needs to be acknowledged. The parents need to know that short stature and infertility are likely, intellectual disability is unlikely, congenital anomalies may be present, and some girls may have learning difficulties.

The treatments and available interventions should be discussed, including growth-enhancing therapy and hormone replacement. With medical supervision, psychosocial counselling and support, girls with TS may lead healthy, productive lives (Frias et al 2003).

Some parents may decide to terminate the pregnancy after the diagnosis. All staff involved in the care of a woman or couple considering a possible pregnancy termination must adopt a non-directive, non-judgmental and supportive approach. There should be no time pressure put on the decision making, however, there may be occasions when the pregnancy is approaching 24 weeks of gestation and, because of existing legislation, a rapid decision will have to be reached. In this instance, the reasons must be sensitively outlined, with an acknowledgment of the added distress that this may cause.

Family stories

Speaking with children and adults with TS and their families can be important for prospective parents and may be facilitated by support organisations such as the Turner Syndrome Support Society (TSSS).

Two families, both members of the TSSS, describe their stories; the loss of a baby in early pregnancy and the successful birth of a baby with TS. Here are Penelope and Lainey's stories.

Penelope's story

The excitement of pregnancy is overwhelming. You see your baby for the first time at the 12-week scan. For Penelope's parents this two-hour joyous appointment turned into, what they felt was a nightmare. Several hours later the consultant informed them that there was 12.2 mm of fluid at the back of the baby's neck and that her heart was abnormal. He explained that amniocentesis (AC) was the only way to determine the cause of the problems. Penelope's parents knew nothing about AC and felt overwhelmed by the turn of events and the information given to them, but they finally agreed to the test.

After two weeks of anxious waiting, the AC result was communicated by telephone. The healthcare professional explained that Penelope had Turner syndrome (TS), but the way the news was communicated meant that her parents retained very little information, and decided to do their own research. Despite a comprehensive search on google for more information they found very little to help them.

Penelope's parents didn't receive much help or advice, apart from a very clear indication that the baby should be aborted. They felt that the information they were given was inadequately explained and they were not supported properly. They were unaware of the TSSS and relied on each other to work through their options. They decided that if Penelope was strong enough to survive then she should be given the best chance at life, and they would deal with whatever problems occurred as a result of the TS. Unfortunately, but as often happens, when they went for a scan at 15 weeks, Penelope had sadly passed away.

Lainey's story

Lainey was the first pregnancy for Tracey and James. The 12-week scan highlighted 5.5 mm of fluid on the back of Lainey's neck and a nuchal translucency test showed that there was a 1 in 4 chance that she had Down's Syndrome (DS). They were advised that chorionic villus sampling (CVS) would confirm a DS diagnosis and they could decide whether to carry on with the pregnancy.

Termination was never a consideration but, as Lainey's father was in the army, and away for long periods of time, the parents wanted to know exactly what, if anything, was wrong with Lainey. Following the CVS, Lainey's parents were surprised to learn that she had Turner syndrome (TS), not DS. TS had not been mentioned in any conversations about Lainey so her parents were not prepared for this diagnosis and were very shocked and concerned. They subsequently did their own research, spoke to the TSSS and to

the doctor to understand everything they could about TS.

Throughout the pregnancy Lainey's progress was monitored with three-weekly scans. During one of the early scans Lainey was found to have a heart valve problem, but by the end of the pregnancy this had resolved itself.

In November 2013, Lainey was born three weeks early, and weighed 6lb 11½ ozs. She is now a gorgeous blonde, blue-eyed chatterbox, who has none of the physical characteristics of TS and, apart from a horseshoe-shaped kidney, is a healthy toddler. Tracey said: "Because Lainey was diagnosed so early on in the pregnancy it meant we had time to get our heads around it. But it's really important that there is more awareness of TS amongst healthcare professionals so they're equipped to give support and guidance".

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Further information

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