SUMMARY Computerised biofeedback has been used to attempt to improve continence in three boys with high anal atresia. The results obtained so far have been extremely encouraging. Over a period of six months progressive improvement has taken place and been maintained in each child.

Anal atresia is a congenital abnormality in which the rectum fails to reach the anus. High (supralelevator) anomalies have an increased incidence in boys. The rectum usually reaches the upper surface of the pelvic floor, but the anal canal is absent and the levator floor is well developed but does not descend further than the bowel. Part of the external sphincter is invariably present but is insufficient to have any useful function. The condition is diagnosed at birth and managed surgically; initially a colostomy to relieve the obstruction may be needed and a pull through procedure performed at 6–12 months. Subsequent to this, sphincter response to rectal distension is usually lost and the continence mechanism disturbed. Secondary surgical procedures endeavouring to improve continence include:2

1. Imitating external sphincter function using skeletal muscle with or without a muscle stimulator.
2. Strengthening the musculus puborectalis by free muscle transplantation.
3. Mimicking the action of the internal sphincter using smooth muscle transplantation.
4. Levator anal release creating an independent muscle sling.

In most cases bowel training regimens based on psychological training, medication, and dietary manipulation are used. These children are often incontinent for many years before achieving control with the help of any of the above methods. Failure may bring about the performance of a permanent colostomy in adolescence. Biofeedback techniques using a simple pneumatic device have been used for this condition, and other operant conditioning regimens have also been used to increase faecal continence.5

Patients and methods

Three boys aged 6–9 years with corrected high anal atresias are already being treated.

An electromyograph is connected to the child by geltrode self adhesive pads and relays electrical signals produced by muscular activity. The signals are conveyed to a computer by connecting leads and a junction box that matches the signal to the computer’s needs and protects the child against any shock hazard. The computer is a BBC Model B and provides audiovisual feedback. A disk system stores the program. Muscle activity, as a function of time, is traced on the screen at an adjustable predetermined speed. Increasing muscle activity is indicated by a rising trace and decreasing activity by a falling trace. Each program can be fully adjusted instantly to the requirements and capabilities of the child. Some programs used are as follows.

Shape. The target pattern is made up of two horizontal parallel lines. The child endeavours to keep the trace above the lines by contraction of his pelvic floor musculature. This is performed on each visit and a printed report kept of the child’s performance. Although we are aware that differences in exact location of sensors and skin condition between sessions means this is not a reliable comparison, it is a useful tool for encouraging the child and his family as an improvement in his performance, as measured by the trace, occurs.

Engines. Images of train engines are drawn on the screen. Appropriate muscle contraction is rewarded by an auditory signal ‘toot-toot’ as the trace hits an engine.

Tennis. A man moves up and down the left hand of the screen serving balls that are returned if hit by a bat controlled by the child. Contracting muscles
moves the bat upwards and relaxing muscles downwards.

**Monkey.** A mechanical toy may be switched on and off by the computer switching as a result of muscle contraction.

On his first visit the child is shown how the computer works, using sensors on the forearm muscles to show that it is painless and can be fun. Terms that each child understands are used. He is then assessed as to the amount of voluntary activity around his perineum and also the extent to which he simultaneously uses other muscle groups. He is then placed in a position that counteracts these additional movements. Two sensors are placed as close as possible laterally to the anus. The muscles are susceptible to fatigue so the child is treated for short periods once weekly, the active phase of treatment being about 10 minutes. Encouragement is given for practice at home.

**Results**

In conjunction with psychological methods and a multidisciplinary approach this technique has achieved a high level of success. Initially, the children were referred with excoriation of their perineums, which were difficult to keep clean, and had poor motivation to be continent. Treatment has resulted in healthy perineums, and the children are now motivated to do well, both competitively with the computer games and at home between treatments (Table). As the internal sphincter is mainly concerned with prevention of soiling this is likely always to be present, but these children can now successfully pass a stool, having sensed its presence, in the lavatory, and are no longer wearing continence aids all of the time. The parents are extremely pleased with the success of the treatment so far.

**Discussion**

This method involves teaching awareness of the pelvic floor, strengthening muscular responses, and teaching when to contract the muscles. The children enjoy their treatment and remain enthusiastic. The anatomy of normal continence is disturbed, but we believe that our treatment will speed up the usual continence acquiring process in this group of children.

**References**

2. Holschneider AM, Becker WC. Reverse smooth muscle plasty:
Changing demography of trisomy 18

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SUMMARY The incidence of trisomy 18 in Leicestershire during the years 1980–85 inclusive was one in 3086 births. Eleven of the 21 babies born with trisomy 18 in this period were delivered by caesarean section. Median and mean periods of survival were 2.5 and 22 days, respectively.

Parents who have had a child with a serious and life threatening disorder such as trisomy 18 (Edwards' syndrome) often seek information concerning its local demography and likely prognosis. Experience of trisomy 18 in Leicestershire over the last six years suggests that this disorder is more common than generally recognised and that the pattern of survival is changing.

Patients and methods

Data for the years 1980–85 inclusive concerning all cases of trisomy 18 delivered in Leicestershire plus those terminated after diagnosis at amniocentesis were obtained from the records of (1) the Leicestershire perinatal mortality survey, (2) all local neonatal units, (3) the clinical genetics service, and (4) the cytogenetics units in Leicester, Nottingham, and Sheffield. The maternal and paediatric records of all cases were obtained and family visits were conducted after approval by the local ethical committee to obtain full details of family pedigrees.

Results

Incidence. Twenty three cases were ascertained (nine male and 14 female), of which two were terminated after diagnosis at amniocentesis. When these two cases are included the incidence during the study (total births 70 985) is one in 3086 births.

Obstetric data. Hydramnios was noted during the third trimester in 11 of the 21 pregnancies. Mean gestation at delivery was 36.7 weeks. Eleven of the 21 babies were delivered by caesarean section, electively in four cases because of intrauterine growth retardation and poor placental function and

Figure Survival of study cases by life table method.
Computerised biofeedback achieving continence in high anal atresia.
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