MEDICAL PRACTICE

Needs of the Disabled

Driving for the disabled

S S TACHAKRA

In this International Year of Disabled People it is important for medical practitioners to know about adaptations available for disabled drivers so that they may suggest suitably modified vehicles to those of their patients who need them.

The ability to drive a motor car can radically alter the quality of life led by disabled people as inability to drive causes brooding and frustration when they cannot do a useful day's work or occupy themselves. Well-advised disabled drivers can drive to offices, shops, pubs, and cinemas without the need of a helper.

Disabilities

A person's disability and the medical condition causing it will govern the type of adaptation needed.

PARAPLEGIA

A paraplegic should use a car with automatic transmission as the conversion to hand controls is easier and the operation of such hand controls is simpler than in cars with a manual gearbox. The latter will require one of the two types of conversions outlined later.

TETRAPLEGIA

The type of vehicle driven by a person with four-limb disability is governed by the degree of completeness and the level of the lesion. People with low-level lesions should be able to drive suitably adapted cars and must be encouraged to do so if they can transfer independently from their wheelchair to the car. Those who cannot transfer should travel in the back of a suitably converted van driven by a helper. A new generation of specialised vehicles may help to give personal independent mobility to some tetraplegics as they enable the disabled person to remain in his own wheel-chair while driving.

The doctor should assess the motor power in the arms to determine which is the more powerful and reliable limb so that it may be used for steering, as it may be possible to operate the hand controls for accelerator and brake by a tenodesis grip.

HEMIPLEGIA

Left-sided disability—Automatic transmission is mandatory, and the driver needs right-hand-operated lights, trafficators, wind-screen wipers and washers, and parking brakes. He reaches across to select the appropriate gear before releasing the parking brake. The sound right leg operates the standard foot brake and accelerator pedal.

Right-sided disability—Automatic transmission is mandatory, and the driver needs an accelerator pedal for the left foot and left-hand-operated parking brake, lights, wind-screen wipers and washers, and direction indicator repositioned on an auxiliary box close to the rim of the steering wheel.

MULTIPLE SCLEROSIS

Multiple sclerosis may be progressive, and increasingly complicated adaptations are sometimes required so that a car with automatic transmission and power-assisted steering and brakes should be selected for adaptation.

RHEUMATOID ARTHRITIS

Pain or stiffness in the joints of the hands may necessitate door catches of the lever or plate variety as the push button type are difficult to operate. Electrically operated windows are

Accident Unit, Central Middlesex Hospital, London NW10 7NS
S S TACHAKRA, MS, FRCSED, consultant

necessary if there is difficulty in using the winding mechanism. The steering wheel knob may have to be modified, and occasionally drivers with a severe disability of the hands need a special device. Panoramic, wing, and overtaking mirrors may be needed if the neck is very stiff. Rotational deformities at the knee and hip may necessitate shifting the foot pedals to one side or the other.

MONOPLEGIA AND UNILATERAL LIMB AMPUTATION

Left leg disability, automatic transmission—No conversion is necessary.

Left leg disability, manual gearbox—The clutch should be adapted so that a handle and lever mounted on the gear change stick may be operated with the fingers. This synchronises gear change with clutch operation. Some drivers may need a hand-controlled accelerator to facilitate hill starts; others will manage by using a "heel-toe" manoeuvre. The alternative is to have a servo-assisted clutch fitted for operation by the right hand. As a vehicle fitted with a right-hand-operated parking brake is difficult to start on a hill the parking brake is repositioned for operation by the left hand.

Right leg disability, manual gearbox—The driver requires hand controls for accelerator and foot brake.

Right leg disability, automatic transmission—The accelerator pedal needs to be adapted for operation by the left foot.

Right hand disability—Automatic transmission is essential, and the driver needs a left-hand-operated parking brake, lights, wind-screen wipers, washers, and direction indicator. A knob on the steering wheel is very useful.

Left hand disability—Automatic transmission is essential, and the driver needs right-hand-operated lights, direction indicator, wind-screen washers and wipers, and parking brake. He needs to reach across and select the appropriate gear before releasing the parking brake.

BRACHIAL PLEXUS LESIONS

Automatic transmission is advisable as the car is much easier to drive and the driver may prefer to use just one hand for all the controls. The flail limb of a complete brachial plexus lesion, however, may be fitted with an elbow stop device, the angle being changed by swinging the limb or with the aid of the other hand to engage the ratchet. The hand may rest on the steering knob to steady it or the driver may prefer to use a specially adapted steering wheel knob.

MUSCULAR DYSTROPHY

Progressive deterioration in the patient's condition makes a car with automatic transmission and power steering essential. Power steering often extends personal independent mobility by quite a few years. Further deterioration may need an adapted van, although many patients lose weight towards the end and can be easily lifted into cars by helpers.

MYASTHENIA GRAVIS

It may be possible to control the weakness of myasthenia gravis with drugs, but it is prudent to ask the person to drive a car with automatic transmission, power steering, and power brakes.

CATARACT REMOVAL

If the patient wears spectacles there will be defective peripheral vision because of cosmetic aberration, and the disability is exacerbated when he tries to reverse his car, thus looking through the spectacles obliquely. A panoramic wide-view rear mirror, wing mirrors, and an overtaking mirror will help considerably.

VISUAL FIELD DEFECT

If the field of binocular vision is under 90° it is unsafe to drive. If the field of vision is over 90° a panoramic wide-view mirror, wing mirrors, and an overtaking mirror are mandatory.

RESTRICTED GROWTH

If a disabled driver's legs are short and do not reach the foot pedals to operate them to their full range of five to six inches (12-15 cm) despite the use of extension blocks or levers for the foot controls conversion to hand controls is necessary. If at the same time he has small hands the lift-up type of hand controls will be unsuitable and a conversion to radial/push down controls is advisable. Modification of the parking brake and a special control panel for the various controls attached close to the steering wheel rim are necessary; automatic transmission is essential.

THALIDOMIDE VICTIMS

For thalidomide victims the controls need to be transferred from the dashboard to a panel on the driver's door close to his right shoulder. The panel will also have electric window controls and extensions to the gear selector lever and parking brake to bring them within reach of the driver.

CONGENITAL DEFORMITIES

A wide range of disabilities can be overcome by methods that range from extensive adaptations for those with severe disabilities, such as foot-steering devices for the armless or a joystick control on a door panel, to simple changes.

ANKYLOSING SPONDYLITIS

A driver with a severe fixed kyphosis may need a moulded driving seat tilted backwards to enable him to get a view of the road. If panoramic and wing mirrors do not overcome the

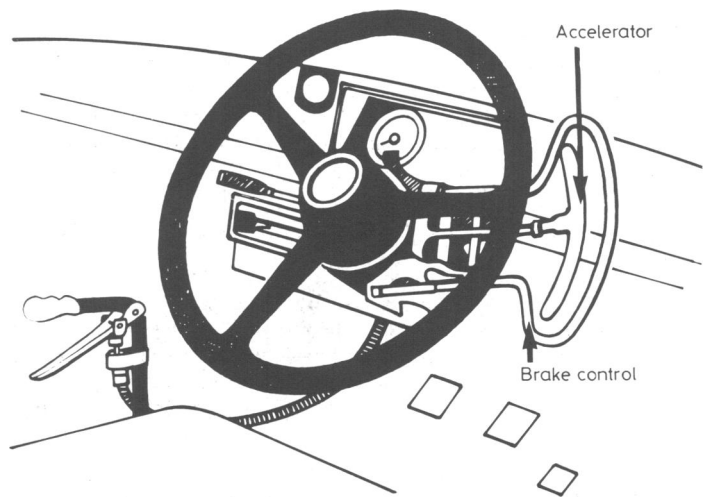

FIG 1—Conversion of a car with manual transmission showing controls that require relatively light pressure.

problem of the neck stiffness a periscope type arrangement will enable him to get a view of the sides and the rear. People with this disability find it difficult to get in and out of a car. A good solution is for the person to use a convertible (open top) vehicle. He can pull the hood shut after entering the vehicle with the hood in the open position.

Types of conversions to hand controls

PULL/PUSH TYPE FOR CARS WITH AUTOMATIC GEARBOX

A single combined lever is used which is lifted for acceleration and pushed downwards for braking. The advantage of this control is that it provides two distinct motions for braking and acceleration. The main disadvantage is that stopping and starting on a hill are slightly more difficult, and there is a neutral area of travel between acceleration and braking that can cause delayed braking time.

CONVERSIONS FOR CARS WITH MANUAL TRANSMISSION

An outer handle under the steering wheel operates the brake and an inner handle operates the throttle, which incorporates a preset lever for reversing or starting on an incline. As these are normally operated with the right hand in some makes of cars the direction indicator would have to be transferred to the left side of the wheel. The clutch is a handle and trigger mounted on the gear change lever and is operated with the fingers. This synchronises gear change movement with clutch operation. All three controls require relatively light pressure since the brake and clutch are assisted by vacuum servo units located in the engine compartment. The pressure on the accelerator and brake is determined by a spring fitted as a standard component in the system and not normally adjusted to the driver's grip. If the disabled driver has a weak hand it is possible to fit a weaker spring, and an arrangement is available whereby there is a vacuum reservoir that is sufficient for four operations of either brake or clutch after the engine has stalled or been switched off (fig 1).

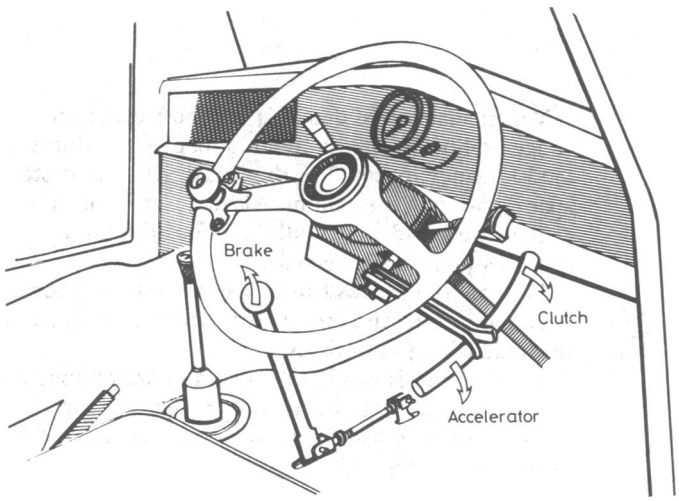

FIG 2—Conversion of a car with manual transmission showing clutch and accelerator as two L-shaped levers.

Alternatively two L-shaped levers, back-to-back forming a T, with the clutch being towards the twelve o'clock and the accelerator towards the six o'clock position are fitted three inches (8 cm) below the steering wheel in the three o'clock position, and the brake is a push on-spring/spring-off lever on the driver's left hand (fig 2).

Other considerations

The disabled driver needs a garage measuring 10 ft 9 in (3·25 cm) with "up and over" doors, and for the considerably disabled an automatic door controlled by an ultrasound beam is almost mandatory. In the absence of a garage it may be possible to have a carport built.

The standard British parking bay of eight foot (2·4 m) is not sufficient for anyone in a wheelchair. Spaces located at the end of a row of parking bays leave one side clear for the disabled person to get in and out of his car. Various parking concessions are available.

Some insurance underwriters do not apply harsh premiums and restrictions for disabled drivers, and help for breakdowns is available from the AA or RAC under normal conditions of membership. Motoring clubs for disabled drivers that have sprung up in the past few years provide information, such as addresses of garages sympathetic to the problems of the disabled, help in assessing vehicles and buying a car, and issue magazines periodically.

A disabled driver with a full driving licence will need to exchange it for a restricted one. If he did not possess a full licence he will need to pass a driving test. It is best to be taught by a driving school.

Petrol stations interested in helping disabled drivers now show the universal disabled sign on their forecourts.

Adapted vans and specialised vehicles

The ability to drive a motor car partly eliminates the disabled person's obvious disadvantage of lack of mobility. When there is the additional handicap of inability to transfer from wheelchair to car and pull the wheelchair into the vehicle several choices are available.

(*a*) If he chooses to continue driving cars he will need the additional help of a "car hoist."

(*b*) He may opt to be driven around by others who help him in and out of the passenger seat of a car.

(*c*) If his electric wheelchair is bulky he may need to travel in the rear of a specially adapted van.

(*d*) A new generation of specialised vehicles is expected to go into production shortly, which will provide personal independent mobility to disabled people unable to transfer themselves from wheelchair to car as they may remain in their own wheelchair while driving—for instance, the Elswick Envoy.

Conclusion

In this International Year of Disabled People it is important that doctors who deal with the disabled are aware of how easy it is for them to drive a suitably adapted vehicle. Many other marvellous assistive devices are available that are not within the scope of this paper. A doctor will have done enough even if he just raises the question of driving and refers his patient to a motoring club for the disabled.

I thank Dr H W Francis-Jones, consultant physician, spinal injuries unit, Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry, for his encouragement; manufacturers of modifications for supplying particulars; and agencies dealing with disabled drivers for helping to accumulate the information in this paper. I am particularly obliged to the many disabled drivers who permitted me to drive their cars and gave me so much of their time in discussing modifications of cars and vans. I am grateful to Mike Ethrington, senior photographer of Central Middlesex Hospital for the illustrations.

(*Accepted 17 June 1981*)