SHORT REPORT

Volitional type of facial palsy associated with pontine ischaemia

Rudolf Töpper, Christoph Kosinski, Michael Mull

Abstract
A dissociation between voluntary and emotional facial innervation is described in a patient with a pure motor stroke due to a unilateral ischaemic pontine infarction. Voluntary facial innervation of the contralateral orbicularis oris muscle was affected whereas emotionally induced innervation of the same muscle was spared. This report provides evidence that fibres conveying voluntary and emotional commands are still separated in the pons. Whereas corticobulbar tracts carry the information for voluntary facial innervation, efferents from the amygdala and the lateral hypothalamus are candidates for the somatomotor aspects of emotions.

Keywords: volitional facial paresis; pontine ischaemia

In patients with the volitional type of central facial palsy facial involvement is most pronounced during voluntary contraction whereas emotionally triggered contractions are preserved or at times even exaggerated on the paretic side. In the emotional type of facial palsy the opposite phenomenon can be seen: whereas voluntary triggered contractions are normal, there is facial impairment during emotionally triggered movements. Automatic voluntary dissociation is not restricted to muscles supplied by the facial nerve: in the bilateral anterior opercular syndrome automatic voluntary dissociation is also seen in masticatory muscles supplied by the trigeminal nerve, in the tongue, and in muscles involved in swallowing. Whereas the volitional type of facial palsy is thought to be caused by a lesion in the motor cortex or in the corticobulbar pathways, lesions in the basal ganglia, the hypothalamus, or the thalamus can cause an emotional facial palsy. The precise neuroanatomical basis of automatic voluntary dissociation, however, has remained obscure. It is not clear at what level above the facial nucleus fibres conveying volitional and emotional information converge. We describe a patient who had an ischaemic...
stroke in the upper pons; he presented with a
volitional type of facial paresis indicating that
the pathways subserving volitional and emo-
tional input to the facial nucleus are still
anatomically separated in the upper pons.

Case report
A 57 year old man was admitted to the neu-
rology department because of a central par-
esis of his left arm and leg with sudden onset.
His medical history was unremarkable. There
was no trauma preceding the episode. On
neurological examination the patient was alert
and oriented. He had a facial paresis with re-
late sparing of the upper portion of the face.
When asked to bare his teeth there was
drooping of the angle of the left side of his
mouth (fig 1A). On involuntary contraction,
however, there was symmetric innervation of
the muscles of the mouth (fig 1B). The
remainder of the cranial nerve examination
was unremarkable; specifically there was no
disturbance of oculomotor function. He had a
3/5 paresis of the left arm and leg with
reflexes being more pronounced on the left.
Babinski’s sign was positive on the left, nega-
tive on the right side. Cerebellar and sensory
function were normal.

A brain CT obtained eight hours after
the onset of symptoms showed no brainstem
lesion. Fourteen days after the event MRI
showed a large hyperintense lesion of the
right upper pons on T2 weighted images (fig
2A and B). This lesion respected the midline,
had contact with the ventral circumference,
and spared the lateral pontine border and the
pontine tegmentum.

Extracranial and transcranial Doppler
sonography showed no evidence of stenosis or
dissection of extracranial or accessible cranial
arteries. Transthoracic and transoesophageal
echocardiography was also unremarkable.

A diagnosis of an anteromedial/anterolat-
eral ischaemic pontine infarction with voli-
tional facial paresis was made.

Discussion
A dissociation of volitional and emotional
facial nerves was found in this patient with a
unilateral pure motor stroke due to ischaemia
in the pons. This finding may provide new
information on the neuroanatomical organisa-
tion of facial innervation. Voluntary motor
impulses from the motor cortex descend
through the internal capsule and either make
direct connections with the facial nucleus
or terminate in the pontine reticular forma-
tion. The pathway by which emo-
tional commands reach the facial nucleus is
not clear in humans. Information from the
amygdala and the lateral hypothalamus,
which are thought to be involved in the gen-
eration of emotions, reach the brainstem via
the medial forebrain bundle and the dorsal
longitudinal fasciculus. Unlike corticobulbar
tracts the amygdala and the lateral hypothala-
mus do not have direct projections to the
motor nuclei of the facial nerve but send
axons to the lateral tegmentum where
interneurons for the facial nerve are located.
These polysynaptic pathways are considered
to form an anatomical basis for somatomotor
components of affective behaviour and are
therefore likely candidates for conveying
emotional responses to the facial nucleus.
That a lesion of these tracts to the lateral
tegmentum may cause an emotional facial
paresis has already been postulated by
Wilson. The dissociation in our patient can,
therefore, be explained by a pyramidal tract
lesion in the upper pons that disrupts the
corticobulbar fibres to the facial nucleus
whereas efferents from the amygdala and the
lateral hypothalamus to the lateral tegmental
area are spared. Because emotional facial
responses such as laughter and crying involve
stereotyped bilateral innervation of facial
muscles it can be argued that the efferents
from the amygdala and the hypothalamus are organised bilaterally. In our patient one could, therefore, postulate that emotional information reached the facial nucleus via the undamaged ipsilateral fibres. This hypothesis is, however, contradicted by the overwhelming majority of patients with hemispheric lesions of descending motor tracts in whom there is both a volitional and an emotional facial palsy. The voluntary and emotional type of innervation of the facial nucleus therefore seems to follow a common pattern with bilateral projections to the muscles of the upper two thirds of the face and unilateral projection to the lower third.

We thank Professor Noth and Professor Poeck for critical reading of the manuscript.


