$$H = \left\{ 1, \begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \end{pmatrix} \right\}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \end{pmatrix} = 1$$

Every subgroup where all elements have second order is commutative, and normal. Also, by Second Sylow theorem all Sylow 2-subgroups are Normal.