Given a unitary representation $\pi$ of a locally compact group $G$ and a probability measure $\mu$ on $G$, let $P_\mu$ denote the contraction $P_\mu = \int_G \pi(g) \mu(dg)$. If $X_1, X_2, X_3, \ldots$ is a sequence of i.i.d. $G$-valued random variables whose common distribution is $\mu$, then the sequence $\pi(X_nX_{n-1}\ldots X_1)^{-1}P_\mu^n$ converges almost surely in the strong operator topology. This result and some of its consequences regarding a more explicit description of the asymptotic behaviour of the powers $P_\mu^n$ when $n$ tends to $\infty$, will be discussed.