

Effects of extracellular magnesium ion on intracellular calcium concentration and on tension development in isolated pig coronary arterial strips.

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Summary

It is well known that magnesium ion (Mg^{2+}) modulates tone and contractility of vascular smooth muscle. To clarify mechanisms by which Mg^{2+} relaxes vascular smooth muscle cells (VSMC), we determined the effect of Mg^{2+} on cytosolic Ca^{2+} concentration ($[Ca^{2+}]_i$) and tension, using pig coronary arterial strips loaded with fura-2. Mg^{2+} reduced both $[Ca^{2+}]_i$ and tension, irrespective of whether the strips were in a resting state, or during exposure to high K^+ , or to histamine stimulation. After pretreatment with Mg^{2+} , the elevation of $[Ca^{2+}]_i$ and tension induced by high K^+ -depolarization or histamine stimulation was inhibited in a concentration-dependent manner. In response to the cumulative application of external Ca^{2+} during K^+ -depolarization, $[Ca^{2+}]_i$ and tension increased in a concentration-dependent manner. The $[Ca^{2+}]_i$ -tension relationship of these Ca^{2+} -induced contractions obtained in Mg^{2+} -treated strips overlapped that obtained in untreated strips. In the absence of extracellular Ca^{2+} , Mg^{2+} had no effects on $[Ca^{2+}]_i$ and tension elevated by histamine stimulation. These results suggest that Mg^{2+} relaxes the VSMC of the pig coronary artery by directly reducing $[Ca^{2+}]_i$, with no effects on the release of Ca^{2+} from store site or on Ca^{2+} -sensitivity of the contractile elements.